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THE C MEETING OF THE NATIONAL COMMERCIAL GAS ASSOCIATION.

THE AUDITORIUM, CHICAGO, December 8, 1908.

Dear JOURNAL: The fourth convention of the National Commercial Gas Association, and the first to be held in another city than that which gave it birth, was held in Chicago the week of December 7th to 12th. This time the ordinary sessions were in reality subordinated to an exhibition of gas appliances, which exhibition was shared in by the American Gas Institute, in that the latter, at the meeting held in New York last October, not only indorsed the project, but also promised to heartily support the display—these pledges were fully redeemed by it here this week. The exhibition was formally opened the evening of Monday, without any particular formalities. We were not "welcomed to the city" in the usual fashion, but the populace of Chicago certainly availed itself of the liberal scope of the Peoples Gas Light and Coke Company's invitation to be present at the first viewing of the exhibits. The crush was certainly great. Despite the fact that the commodious drill room of the Armory of the First Regiment of Chicago afforded floor space for the exhibitors, the aisles were all too small for the throngs that passed along them. However, fairly good order was preserved despite the crush. In connection with the mechanical arranging for the exhibition it is noteworthy that the mechanics did not get opportunity to enter the premises until the afternoon of the prior Saturday, but the exhibitors were quite pronounced in saying that no hindrance of moment happened them in putting their goods in order. The cleverness of the mechanical force of the Peoples Gas Light and Coke Company was equal to the task, however, and that they are workmen is well attested by the excellence of the pipe lines run for the exterior and interior illumination of the Armory and the supply pipes to the exhibitors' booths. The lighting arrangement afforded good opportunity for the gas arc men, and it was fully and beautifully taken advantage of by the Humphrey Company in the placing of well over 100 arcs. The building itself, which is on Michigan avenue and 16th street, presented a beautiful sight when the especial exterior illumination thereof was in full view. Thirty-five high candle arcs were appropriately placed along the avenue front and the 16th street side, 35 lamps being required for the work. The effect was certainly pleasing and satisfying, and also convincing that gas can and does answer for satisfactory interior effect. The opening of the display was brought to a satisfactory close about midnight, and it is a surety that the average Chicago citizen knows more about gas and its uses for other than lighting purposes than he ever did before; and there is much, too, in that knowledge that brought him great enlightenment. The attendance is excellent—two special cars, carrying well on to 100, came in from the East Monday morning. The weather is good, although rather raw and low to the mercury, but the Lake wind, luckily so far, has been off shore. The first regular session of the Association was held the morning of Tuesday, with the President, Mr. Frank W. Frueauff, in the Chair. Secretary Lucius S. Bigelow was also well in evidence, and he had good reason for vivacity, in that the attendance was a well put testimonial to the accuracy of his prediction of two years ago that the National Commercial Gas Association was "here to stay." The session was held in the Board of Officers' Room of the Armory, and the attendance was a strong test of its capacity. There was no delay in getting at the regular order. Routine business, of course, came first. This included the report of the Secretary to the Board of Directors on account of the exhibition, the regular annual report of the Secretary-Treasurer, etc. As a consequence of the report of the Nominating Committee the officers elected for the ensuing year were:

President.—J. D. Shattuck, Chester, Pa.
First Vice-President.—J. C. D. Clark, Chicago, Ills.
Second Vice-President.—R. M. Searle, Rochester, N. Y.
Third Vice-President.—W. H. Allen, Camden, N. J.
Secretary and Treasurer—L. S. Bigelow, Willimantic, Conn.
Directors.—H. B. McLean, A. K. Cantril, P. S. Young, C. W. Hare, L. B. Young and H. J. Trenkamp—the latter was chosen to fill out the unexpired term of Mr. J. C. D. Clark.

Next came President Frueauff's address, which, although brief was pithy and well received. A notable recommendation therein was the appointing of a Committee to study and report upon the standardization of industrial appliances. Then came the paper on "Records of New Business Departments," by C. M. Cohn, of the Baltimore Consolidated Gas and Electric Company. In it he advanced some good thoughts based on the experience of his Company in these regards. Necessarily the presentation had much to do with set forms and the like, but these tabulations were of more than passing interest, since they represented successfully applied practices in the Baltimore corporation's success through following the plans outlined. The day's business session was brought to a close by Mr. T. J. Litle's recital of how best to proceed in "Meeting Competition from High Efficiency Lamps." This paper was well discussed, and some quite original ideas were brought out by the debate. The balance of the afternoon and evening was devoted to a re-examination of the displays. Everything in the exhibition line was now working smoothly and well, and the display is a thoroughly creditable one. That it is representative may be well understood when I note that 65 separate exhibitors are entered. The entertainment programme (many ladies are in attendance) was being nicely carried on meanwhile. No further reference to these features will be made in these despatches, save to say here that they are of a pleasing and diversified order—the list including luncheons, theater parties, automobile explorings, etc. The last paper of the afternoon was that by Mr. B. O. Tippy, of Grand Rapids, whose communication on "Gas Lighting" was in his usual interesting and convincing vein. Towards the close of the session it was noted that Mr. H. B. McLean, of New York, was acting as Secretary. The deplorable reason therefor was the sudden death of the mother of Secretary Bigelow, which sad event caused his immediate departure.—C.

THE AUDITORIUM, CHICAGO, December 9th, 1908.

Dear JOURNAL: The second day's session was commenced promptly at the hour appointed, and the number of those in attendance was all too great for comfort in the limited meeting space afforded by the Armory's office quarters. The thermometer outside had gotten near to the melting point, and the temperature and atmospheric conditions

SMITHSONIAN DEPOSIT.

of the Armory as a whole were far from endurable. The opening number for the second day was a paper entitled "The Marketing of Coke," by Mr. R. A. Field, of Rome, N. Y., the points in which merited a much brisker discussion than that awarded it. Mr. C. W. Hare, of Philadelphia, certainly should be well pleased over the applause which was freely given during its reading and at its termination. The paper dealt with the general relations existing between public service corporations and their customers, and went to the extent of arguing for special training to the acquiring of technical knowledge as desirable (even necessary) for complaint clerks. The discussion that followed was very interesting. Mr. Staunard stated that his Company had, in fact, tried a technical graduate, thoroughly experienced in distribution work, at the complaint desk, with very good results. The President introduced Mr. Morrison, who stated that the British Navy had been experimenting in the establishment of a Naval Reserve force of firemen, recruited in part from the merchant marine, and from stokers in gas works also. The Secretary in turn introduced Captain Staunton, U. S. N., who in a well set speech outlined a tentative plan whereby the gas works stokers in the United States might enroll as a corps of Naval Reserve Firemen, to be in reserve in time of war, as being particularly well fitted for the arduous duties required of stokers on men-of war. The Captain concluded by asking the co-operation of the Association in this matter. His speech was received with vigorous applause. Then, at the request of the President, Mr. M. Kirchberger, of New York, on behalf of the Association, replied to Captain Staunton in words, some of which, while they had all the fervor of patriotic splutter, were rather ambiguous as to direct applicability to the matter in hand. The Association voted to refer the whole thing to their respective companies, which are quite likely, from many points of view, to question the propriety of the handling of a project of this nature by an association the best energies of which are supposed to be altogether directed towards the best means and methods of increasing gas sales. However, such straining might not be taken as evidence that the rising vote of thanks passed to Captain Staunton were not duly and properly his. At this juncture the President formally announced the bereavement that had come to Secretary Bigelow. On motion of Mr. Rogers the President was directed to appoint a committee of three to convey the Association's regret over Secretary Bigelow's sorrowful visitation. Mr. G. D. Roper next called attention to the fact that this was the first meeting of any gas association for 20 years that had not been attended by Mr. Fred. R. Persons, whose absence now was attributable to serious illness. On Mr. Roper's motion the Secretary was instructed to telegraph to him their good-wishes, chiefly to the extent that he might speedily be on his active way as of yore. At this point the atmosphere had become so unbearable that an adjournment for 5 minutes was ordered so that the room might be rendered habitable. When the required degree of purity had been attained President Frueauff presented Mrs. Helen Armstrong, of Chicago, whose gem of a paper on "Demonstration Work" was all to the good. For clearness of vision, and terse, forceful rendition, she simply leads (I had almost written "loses") them all. One pithy line, "Demonstration is convincing others that what you say is so," gives the secret of her code. She convinces to a certainty. Good for the Queen of demonstrators. The good paper on "Model Kitchens, by Mr. G. W. Thompson, of Chester, Pa., was read at this time, and a joint discussion was had over both, not the least sensible and pleasing part of which was contributed by Secretary Gifford, of the New England Association of Gas Engineers. The concluding paper for the day was that by Mr. S. Tully Wilson, of Denver, Col., on "Industrial Appliances." It is in every sense an interesting, thought-compelling document, leading irresistably to the conclusion that this fruitful field was still fairly fallow. This leaves 7 papers for to-morrow, prominent in which is that by Mr. H. L. Doherty, on "Exhibition of Appliances a Necessity in Purchasing." Under the circumstances, and preferring to make mention thereof at some fair length rather than to slur their noticing, I will telegraph nothing further, since well I know that press time will not wait. The arrangements for the banquet are complete, the side lights for the ladies are glowing brightly, attendance at the display of apparatus and appliances on the Armory floor is to the full testing of its space, the weather remains clear, and the total teaching of it all is the surety that the first away-from-home convention of the National Commercial Gas Association proves that its type and plan of aeroplane movement may be certainly depended on to fly it safely.—C.

BRIEFLY TOLD.

THE PENNSYLVANIA GAS ASSOCIATION.—A number of gas men in the State of Pennsylvania met, in the Board of Trade Building, Harrisburg, on Wednesday, December 2d, and organized the Pensylvania Gas Association. The following officers were elected:

President.—L. S. Williams, Harrisburg.
First Vice-President.—E. G. Holger, Easton.
Second Vice-President.—Jno. H. Keppelman, Reading.
Secretary and Treasurer.—Wm. H. Merritt, Lebanon.
Members of Council.—To serve 1 year: C. W. Butterworth, Milton; J. W. Murdock, Bethlehem; A. B. Plank, Gettysburg. To serve 2 years: H. H. Gauser, Morristown; Herbert Williams, Pottstown; C. D. Bains, Ardmore.

It was determined to hold the First Annual Meeting on the second Wednesday of April, at 10 A.M. We are indebted to the attention of Mr. Merritt for courtesies in connection with this information.

Obituary.—George Thomas Livesey.

[AN APPRECIATION FROM OUR ENGLISH CORRESPONDENT.]

"Take him for all-in-all, we shall not look upon his like again."

This well-known quotation, so often used with more regard to compliment than to literal truth, may appropriately form the heading to this brief obituary note, and be used as such in all sincerity and without a trace of exaggeration. For in the death of Sir George T. Livesey, which occurred on October 4th, the gas industry at large deplores the loss of an acknowledged leader. His business record reads remarkably short and simple. He was born in London, in 1834. His father, Mr. Thomas Livesey, was at the time in the service of The Gas Light and Coke Company, and resigned his position 5 years later, to enable him to accept the office of Engineer and Manager to the then newly established South Metropolitan Gas Company. In 1848, at the early age of 14, the subject of this memoir also entered the service of the Company, and a few years after was in evidence as a capable assistant to his father, in controlling aad providing for the needs of a rapidly increasing business. In 1862 he assumed responsible control of the engineering and technical department, his father retaining the position of Secretary and General Manager. On the death of the last named, in 1871, Mr. Geo. T. Livesey took entire control as Engineer and Secretary. In 1882 he retired, and was immediately elected to a seat on the Board of Directors. Three years later he was appointed Chairman, and retained that position uninterruptedly to the day of his death. For several years he was a Director of a neighboring undertaking, the South Surburban Gas Company, and was elected Chairman in 1904. In that year he vacated the position of Director in another London Gas Company, the Commercial, which he had held for 4 years. His utterances from the chair have always been regarded in the profession as one of the events for the year. It was his duty, at each half-yearly meeting of shareholders, to set forth the principal events of the period under review, and this was done in such a lucid and complete manner that it represented not only the fortunes of the undertaking, but reflected in no uncertain manner the principal items of interest to the industry in general. He was largely in request as a consulting engineer and expert witness before Parliamentary Committees, and the success that attended his co-partnership scheme gave him a prominent position in connection with public questions relating to conditions of employment and labor. He received the honor of knighthood in 1902.

But there is nothing in this record that adequately explains the position held by Sir George, not only in respect to the companies with which he was immediately concerned, but towards the gas industry as a whole. There are men who have advanced from the bottom to the very top of the ladder, who hold blameless records and have taken the lead in the control of large and important gas companies. They are deservedly esteemed by their associates, but are only names, even to many of the employees under them and to the profession at large. But Sir George was more than a name. He was a living and active personality in the board room, on the works, in the district and at gatherings of gas managers. It is difficult to correctly set out the methods and motives which actuate human conduct. They are for the most part a confused jumble of moral and mental caliber, of physical and intellectual energy, of bodily health, of environment and outside influence. How often, in reading two or more distinct biographies of some eminent personage, we come across opinions that are diametrically opposite, yet both to a large extent correct. But, on carefully looking through the score or more of personal appreciations that have appeared in our technical press, the numerous references at meetings of gas engineers or shareholders, and a large number of press or pulpit references, one cannot fail to be impressed with the unanimity that characterizes the main lines of thought and which renders it an easy task to point out, with no uncertain sound, some of the chief features in a most remarkable and most admirable character.

The dominant note was a strict and uncomprising adherence to Christian principles, and an unostentatious but none the less evident determination to carry the same into all the affairs of life. His religion did not go off and on with his Sunday clothes, nor did it partake of the character of the man who had led an upright life since he retired from business. All his reviewers emphatically put this point first. Coupled with marvellously keen perceptive powers, capable of accurately sizing up the present position and forecasting the future, was a highly strung sympathetic nature. He had a far reaching and correct appreciation of the weaknesses and of the capabilities of human nature. His influence was always on the side of

righteousness, truth and justice, without regard to sordid considerations and undeterred by fear of consequences. A born fighter, when occasion arose, who always had the courage of his convictions, and at the same time a born peacemaker, not only able to bring out the best of his own abilities, but to inspire, attract and develop the same in all with whom he was associated. Added to these high spiritual and moral attributes we find industrious and regular habits of life, untiring energy, perseverance and keen intellectual power. In the fullest sense of the word he was an originator who could not only clearly define the object required, but also the straightest and simplest means by which it could be obtained. More than this, he possessed in an eminent degree the art of making his designs as clear and plain to other people as they were to himself. There was no diplomacy and no ambiguity. All that he said or did was perfectly plain and did not admit of two interpretations, and he preferred to appeal to the best side of human nature and not to its weaknesses. While others were speculating and constructing ingenious theories as to the actions that were going on inside the hydraulic main, and the condition of the liquids, he put a piece of plate glass into one side of the apparatus, through which he could look in and see what was actually going on under working conditions. Many complicated calculations, involving elaborate mathematical formula, were applied to the determination of the proper curve for the crown of a gasholder. He took a piece of large size gas main, plugged one end, tied a piece of sheet rubber over the other, admitted gas under pressure, and observed the curve taken by the flexible material. While always keenly appreciative and interested in the labors of others he preferred to work on his own methods, and conducted the affairs under his charge as if there was no other gas company in existence, proving every detail and knowing the reason for it. He was not troubled with the defects, the weaknesses and eccentricities that so frequently mar the character of men of acknowledged genius. There was nothing of the crank about his work, but all his plans were sane, sound and practical. They needed little if any revision and never called for reconstruction on new lines.

As an engineer, Sir George will be chiefly remembered in connection with the gasholders at Old Kent Road and the construction of an entire new works on a large scale at Greenwich, which included a gasholder of 12 million cubic feet capacity. This holder was for many years the largest in the world. The characteristics above noted were carried through all his designs. The work was substantial, strong and capable, but utterly devoid of anything superfluous, ornamental or otherwise. He always gave the workman the benefit of the doubt in any question of manual *versus* mechanical labor, and was in favor of simplicity rather than elaboration. He did not go to the extent of adopting every so-called modern improvement, and depended for his excellent results upon working established processes to the fullest and best advantage, rather than to following up the latest scientific lines. But he did not hesitate, when satisfied that it would suit his purpose, to go out of the accepted tracks. He took a great interest in the prevention of Sunday labor at a time when such was the exception rather than the rule, and the majority of gas engineers were not convinced as to its practicability. The practice now general in gas works, of ceasing gas making for at least 12 hours on the Sabbath, was assisted in no small measure by his efforts and example. Though continually engaged in research and experiment, he took out a very few patents, something under a dozen, but this number most inadequately represents the numerous devices and methods that he originated and brought into working order. He was an active member both of the National and of his District Association of Gas Engineers, frequently contributing papers, and a ready speaker in discussion. When it was known that Sir George was going to speak a full attendance was assured. He gave much attention to the utilization of ammoniacal liquor as a purifying agent, and probably the best known and most extensively used of his inventions is the Livesey washer. But his most characteristic work was the improvement in stability and the reduction of cost of gasholders and tanks.

At an early period of his career, the eminent sense of justice and desire to assist all who came within the sphere of his operations, led him to realize the fact that the gas industry involved, not one but three interests, and that these, though apparently conflicting, if not antagonistic, were really mutual and interdependable, and his efforts were directed towards the development of a three-sided agreement that would meet the rights and unite the interests of all. He lived long enough to perfect his schemes and to prove that an arrangement on these lines was not only right in theory but sound in practice. The shareholder wants his dividend, the workman seeks an advance in wages and the consumer a reduced price for gas. In respect to either party, it may be said that there is a tendency to regard the matter from his point of view alone, and not to concern himself about the other two. The first move was the sliding scale, which gave the stockholder an interest in the price of gas. In place of fixed dividends, practically independent of price, he suggested a converse variation. Given an agreed initial price for gas and standard rate of dividend, every penny reduction in price would entitle the shareholder to an additional ¼ per cent. of dividend. A rise in price above the initial rate would in like manner reduce the dividend. At the same time he offered inducements and facilities for consumers of gas to become shareholders. The directors and shareholders thus received a direct inducement to encourage any process or method of working that would reduce the selling price of gas, This scheme had a far-reaching effect. Inventors found that their efforts met with more encouragement and advance was stimulated, Each successive reduction in price increased the demand for gas and paved the way for further advance. The success of the sliding scale, as applied to the South Metropolitan Gas Company, secured a place on our statute books and a very extensive adoption throughout the country.

Meanwhile Sir George had the improvement of the workmen steadily in view. In 1889 he introduced his co-partnership scheme, under which the third party, the worker, came in for a share in the advanced prosperity of the concern, and received a direct incentive to study its interests. Every employee in effect became a working partner. As with the sliding scale, the success that has attended the scheme has led to its extensive adoption, even outside the gas industry. It is no discredit to the scheme that it did not find favor with the labor unions. Naturally it would not do so, seeing that it puts an end to the necessity for their existence. They combined to squash the whole thing, and threatened that if it was not withdrawn they would bring out their members. This they did, just before Christmas, 1899, in the belief that Sir George would be helpless in their hands, just at the busy season of the year. They reckoned wrongly. Sir George was prepared to uphold his views with a determination, courage and persistency that roused attention and admiration on all sides. After a desperate struggle, in the course of which the fullest influence and resources of the unions were applied, they were completely and hopelessly defeated. Sir George always gave credit to his assistants and colleagues, but it was well known that he bore the brunt of the battle. Twenty years' experience has proved that Sir George was in the right.

The arrangements in connection with the funeral of a prominent personage are in no small degree a reflection of his religious views, his social life, his personal habits, his lines of thought and sphere of action, and even of his recreations. The large number of gas engineers, representing almost every town of importance in the United Kingdom, who sorrowfully assembled at Nunhead Cemetery (one of the principal Metropolitan burying places, and situated in the district supplied by the South Metropolitan Gas Company) on October 10th, for the purpose of showing their esteem respect and admiration entertained towards the subject of this memoir, must have been impressed by the fact that the occasion was characteristic of the man. It was known that all who hoped to get within seeing and even hearing distance must arrive early, and an hour before the allotted time the visitors began to take their places and rapidly mustered up to an attendance that would be a creditable showing at any meeting of the Institute of Gas Engineers. The paths to be presently traversed by the funeral cortége were lined by a guard of honor composed of foremen from the two gas companies before mentioned, intelligent looking, respectable men, decently clad in mourning and wearing crape rosettes. A wide space round the grave was roped off and similarly guarded. The crowd in the grounds and round the gates proved that these arrangements were no mere matter of compliment, but an absolute necessity. All uninvited peasons were efficiently kept back, and in no other way would it have been possible to accommendate the large fellowing.

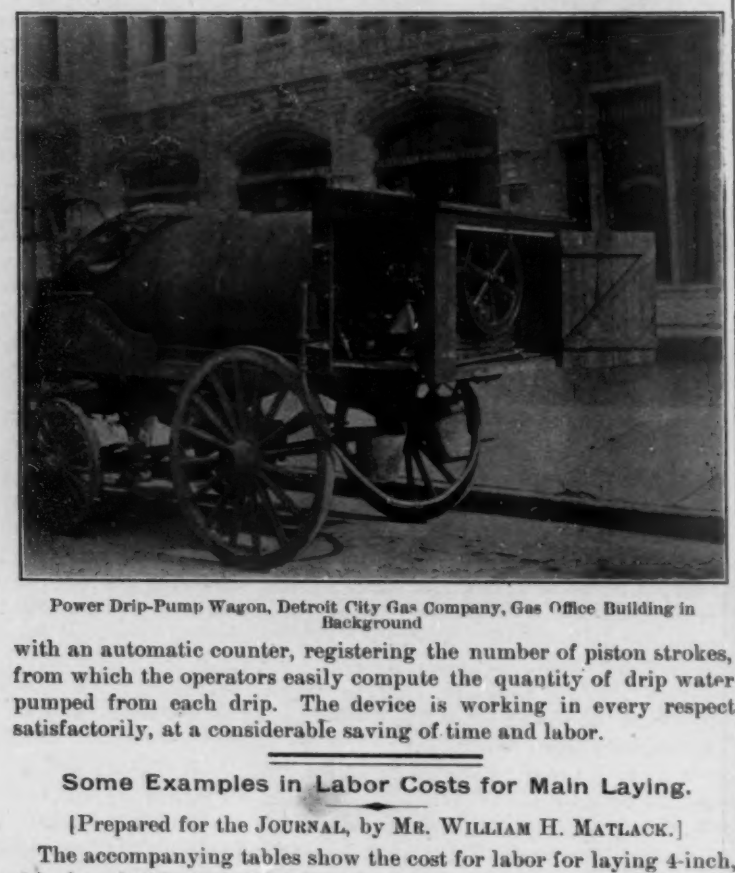
A party gathered at the offices of the Institution of Gas Engineers and drove direct to the cemetery, passing *en route* over the way to be taken by the procession, which was to start from the gas works at Old Kent Road. On reaching this locality it was seen that the thoroughfares presented the appearances associated with the obsequies of a royal personage. Footwalks, doors and windows, occupied by crowds of sympathetic, orderly people, flags half mast high at frequent intervals, drawn blinds and other emblems of mourning, and the carriageway kept clear by large bodies of police. Tram cars had to be stopped and the ordinary traffic diverted.

A simple, unostentatious procession was meanwhile being formed up in the grounds of the gas works. The company waiting at the grave side had a good view as it entered the cemetery gates, after traversing a distance of nearly two miles. Three funeral cars were needed to carry the wreaths and floral emblems received from hundreds of sympathetic friends, which included several unusually magnificent specimens. About 20 carriages followed, conveying relatives and intimate friends. Then came a grand following of gas employees, some 7,000 strong. Walking 4 abreast they covered a distance of 1½ miles and occupied nearly half an hour in passing any fixed point. They were headed by the band attached to the Old Kent Road gas works, and by the principal officers and office staff. The first part passed to the chapel, and while the service was in progress the followers quietly took up their positions. The scene at this time was most impressive, nearly 10,000 people silently waiting the last rites of the Church of England burial service. These having been duly accomplished, and two hymns effectively rendered under the leading of a choir of 40 men's voices, all employees at the South Metropolitan gas works, the officiating clergyman delivered an appropriate address based on a 40 years' acquaintance with the deceased. He eloquently testified that Sir George not only gave largely of his money, but time and personal effort, to the cause of religion and temperance, and to the Christian habit of life that had been consistently followed from boyhood, and referred to the establishment of the co-partnership scheme as above described, and urged that the good work should go forward on the basis already laid down.

The workmen's procession at the funeral, and the position of the South Metropolitan and Suburban Gas Companies to-day, are monuments of the benefits bestowed upon the gas industry, to which Sir George ungrudgingly and unwearyingly devoted the best of his grand abilities for 60 years.

A Power Drip-Pump Wagon.

The photograph (for which we are indebted to the courtesy of the Company's General Manager, Mr. Irvin Butterworth) shows a power drip-pump, recently put in operation by the Detroit City Gas Company. It is operated by a small gasoline engine, and is equipped



Power Drip-Pump Wagon, Detroit City Gas Company, Gas Office Building in Background

with an automatic counter, registering the number of piston strokes, from which the operators easily compute the quantity of drip water pumped from each drip. The device is working in every respect satisfactorily, at a considerable saving of time and labor.

Some Examples in Labor Costs for Main Laying.

[Prepared for the JOURNAL, by MR. WILLIAM H. MATLACK.]

The accompanying tables show the cost for labor for laying 4-inch, 6-inch and 10-inch gas mains. The last was laid first, then the 6 and 4, respectively.

Lines 1, 2 and C were laid in the spring of 1908. The 10 inch line (2) was laid first and was almost all laid on rainy days in wet ditch, from 1,500 to 2,000 feet of the ditch being one-third full of water at one time, which caused it to cave, and about 900 feet had to be redug, aside from bailing with buckets some 2,000 feet of its length. The ditch averaged 3 feet 6 inches in depth and was 28 inches wide. One creek was crossed where lead joints were used (see sketch). All other joints were made with cement.

TABLE No. 1.

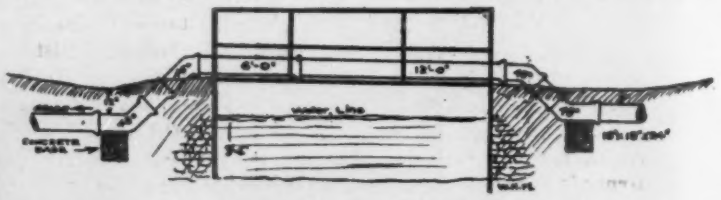
	Job A.	Job I.	Job II.
	Size		
	4-Inch.	6-Inch.	10-Inch.
Total feet laid	1,412	1,302	5,781
Team and driver	.007	.014	.023
Foreman	.007	.005	.007
Superintendent	...	.005	.007
Excavating	.040	.033	.058
Calking	.004	.007	.012
Backfill	.040	.032	.058
Sundry excavation	....	.002	.006
Total cost per foot	.098	.096	.171

TABLE No. 2.

Job No.	"B."	"C."	"D."
Size, inches	4	6	6
Total number feet laid	595	841	993
Team and driver	.009	.011	.120
Foreman	.009	.003	.150
Superintendent	....	.005	
Excavating	.052	.409	.500
Calking	.007	.009	.110
Back bill	.050	.125	.137
Total cost per foot	.127	.125	.137
Tests made	1	1	1
Cover (average)	3'	3' 6"	3'
Soil	Clay	Clay	Clay

The following fittings were put in on the 10-inch line, three 10-inch drips, thirteen 5-inch tees, one 10-inch cross, and one 10-inch by 6-inch reducer.

The 6-inch line (1) was laid next, and under similar conditions. Only one test was made and the following fittings were used: Three 6-inch crosses and three 6-inch by 4-inch tees. The 4-inch lines were



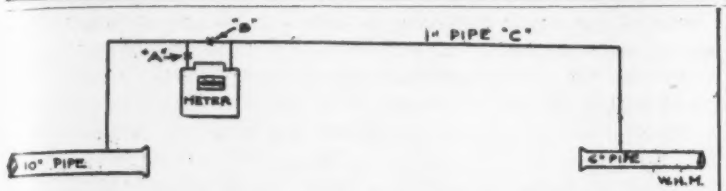
put in during the summer, when the weather was good and the soil dry. It was noted that 3 feet of yarn would make four 4-inch joints, and that 1 sack of cement would calk and cap thirty-two 4-inch joints. Lehigh cement was used, and, from records of tests made about 3 years ago, shows a testial strength of from 500 to 600 pounds to the square inch.

The column headed "Sundry Expenses" is for watchman and water boy. The former was rated at 17½ cents per hour and the water boy at 15. The foreman received 27½ cents per hour, and calkers were rated at 22 and 25 cents. A night watchman was employed throughout the job, and a man for Sundays. The testing (all with air) was done with an old-style hand pump that required 10 men to operate. In testing 12 men were used, 10 to pump up the line, 1 to soap joints and 1 to look after the gauge. The time taken up by a test varied from 45 minutes to 1½ hours. This time is distributed as well as possible between the laborers and calkers, as all took a hand.

The ditch was hand-tamped every 6 inches to 8 inches. The soil was half-and-half sandy clay and gumbo, with the exception of about 150 feet of quicksand encountered in laying the 10-inch line. All pipes were tested before going into the ditch, and all leaky joints were cut out and redriven, there being 18 on the 10-inch line, due to rain over night on green joints. The 10-inch line was tested from 4 parts. The team was used in hauling pipe and other supplies from the plant to the job, a distance which would average 2 miles.

The total number of feet laid on this job was 18,427– viz., 6,200 feet of 10-inch, 4,638 feet of 6-inch, and 7,589 feet of 4-inch. This work was done during the months of May and June, 1908. The gang averaged 25 men. The record days' work was 52 joints of 6-inch and 29 joints of 4-inch. Ditch opened and pipe laid and calked in 10 hours.

After completing this line a final test was thus made (see sketch). The piping was done, as shown in sketch, and a meter set; the pressure was then equalized by running gas from the old 10-inch line through the 1-inch line and into the new line, this line being opened at B for 15 minutes, at the end of which time B was closed and A



opened, letting the gas pass through the meter and register. After the register was made, which took about 10 minutes, the meter was read and noted, then left standing for 2½ hours, at the end of which time it was reread, and finding the reading to be the same as at the time of first registering, thus showing that no gas had passed through the meter, that there were no leaks in the new line. The following day men were sent along the line and all drip leads were opened, allowing all air to pass out. This line was laid during an unusually wet spring, and all costs are a little higher than they should be, yet the tables will give a fair idea of what work will cost under such conditions.

[Concluded from Page 980.]

Report of Sub-Committee on Calorimetry as Presented to the Third Annual Meeting, The American Gas Institute.

Appendix A.

The Junkers' Gas Calorimeter.—This apparatus consists essentially of a combustion chamber, the walls of which consist of an annular copper vessel. Inside this annular space a large number of copper tubes are fitted, through which the products of combustion escape by flowing down from the top of the chamber to an outlet closed by a throttle valve at the bottom. A current of cold water surrounds the tubes, and, flowing upwards, escapes through a suitable outlet at the top of the apparatas. The coldest water, therefore, meets the coldest gases. As a consequence, products of combustion are completely reduced to atmospheric temperature before they escape to outer air. Thermometers are fitted both at the point where the water enters and at that where it escapes. The rate of flow is maintained constant by leading the supply into a small tank with an overflow, whilst the heated water escapes from a second overflow. The heat producing flow is thus kept constant, but the rate can be adjusted to any desired speed by means of a cock at the inlet to the calorimeter. The water supply required is from ¼ to ½ of a gallon per minute. The gas supply to burner is measured through any accurate meter, and it is well to introduce an efficient governor between this and the burner. The water supply tube is connected to the nipple, and adjusted so that the rise of temperature in the outflowing water is from 10° to 20° C. The tightness of the gas connections is ascertained by turning off the burner, when the meter index should remain perfectly stationary. The height of the flame should be so adjusted that not more than 6,000 B.T.U.'s are produced per hour. In taking the readings, the hot water discharge is turned into the measuring glass, when the pointer of the gas meter passes the zero mark. The temperature of the discharge is noted 5 or 6 times whilst measuring glass is filling, which takes from 1 to 6 minutes. When full, the gas is turned off, and the quantity used read. Having obtained this, and knowing the quantity of water used, and the number of degree through which it has been raised, the calorific value per cubic foot of gas is readily obtained.

The Boys' Gas Calorimeter.—This calorimeter, which has been designed by Mr. Boys, is shown in vertical section. It consists of three parts, which may be separated, or which, if in position, may be turned relatively to one another about their common axis. The parts are (1) the base *A*, carrying a pair of burners *B*, and a regulating tap. The upper surface of the base is covered with a bright metal plate held in place by three centering and lifting blocks *C*. The blocks are so placed as to carry (2) the vessel *D*, which is provided with a central copper chimney *E* and a condensed water outlet *F*. Resting upon the rim of the vessel *D* are (3) the water circulating system of the calorimeter attached to the lid *G*. Beginning at the center where the outflow is situated, there is a brass box which acts as a temperature equalizing chamber for the outlet water. Two dished plates of thin brass *KK* are held in place by three scrolls of thin brass *LLL*. These are simply strips bent round like unwound clock springs, so as to guide the water in a spiral direction inwards, then outwards, then inwards again to the outlet. The lower or pendent portion of the box is kept cool by circulating water, the channel for which may be made in the solid metal, as shown, on the right side, or by sweating on a tube, as shown on the left. Connected to the water channel at the lowest point by a union are 5 or 6 turns of copper pipe, such as used in a motor car radiator of the kind known as Clarkson's. In this a helix of copper wire threaded with copper wire is wound round the tube, and the whole is sweated together by immersion in a bath of melted solder. A second coil of pipe of similar construction surrounding the first is fastened to it at the lower end by a union. This terminates at the upper end in a block, to which the inlet water box and thermometer holder are secured by a union, as shown at *O*. An outlet water box *P*, and thermometer holder are similarly secured above the equalizing chamber *H*. The lowest turns of the two coils *MN*, are immersed in the water, which in the first instance is put into the vessel *D*.

Between the outer and inner coils *MN* is placed a brattice *Q*, made of thin sheet brass, containing cork dust to act as a heat insulator. The upper annular space in the brattice is closed by a wooden ring, and that end is immersed in melted rosin and beeswax cement, to protect it from any moisture which might condense upon it. The brattice is carried by an internal flange, which rests upon the lower edge of the casting H. A cylindrical wall of thin sheet brass, a very little smaller than the vessel *D*, is secured to the lid, so that when the instrument is lifted out of the vessel and placed upon the table, the coils are protected from injury. The narrow air space between this and the vessel *D* also serves to prevent interchange of heat between the calorimeter and the air of the room.

The 2 thermometers for reading the water temperatures, and a third for reading the temperature of the outlet air, are all near together and at the same level. The lid may be turned round into any position relatively to the gas inlet and condensed water drip that may be convenient for observation, and the inlet and outlet water boxes may themselves be turned so that their branch tubes point in any direction.

A regular supply of water is maintained by connecting 1 of the 2 outer pipes of the overflow funnel to a small tap over the sink. The overflow funnel is fastened to the wall about 1 meter above the sink and the outer pipe is connected to a tube in which there is a diaphragm with a hole about 2.3 mm. in diameter. This tube is connected to the inlet pipe of the calorimeter. A piece of stiff rubber pipe, long enough to carry the outflow water clear of the calorimeter is slipped on to the outflow branch and the water is turned on so that a little escapes by the middle pipe of the overflow funnel and is led by a third piece of tube into the sink. The amount of water that passes through the calorimeter in 4 minutes should be sufficient to fill the graduated vessel to some point above the lowest division, but insufficient in 5 minutes to come above the highest division. If this is not found to be the case, a moderate lowering of the overflow funnel, or reaming out of the hole in the diaphragm, will make it so. The overflow funnel should be provided with a lid to keep out dust.

The thermometers for reading the temperature of the inlet and outlet water should be divided on the Centigrade scale into tenths of a degree, and they should be provided with reading lenses and pointers that will slide upon them. The thermometers are held in place by corks fitting the inlet and outlet water boxes. The positions of these thermometers should be interchanged every month. The thermometers for reading the temperature of the air near the instrument and of the effluent gas should be divided on the Centigrade scale into degrees.

The flow of air to the burners is determined by the degree to which the passage is restricted at the inlet and at the outlet. The blocks *C*, which determine the restriction at the inlet, are made of metal $\frac{3}{16}$-inch or about 5 millimeters thick, while the holes round the lid which determine the restriction at the outlet are 5 in number and are $\frac{5}{8}$-inch or 16 millimeters in diameter. The thermometer used for finding the temperature of the effluent gas is held by a cork in the sixth hole in the lid so that the bulb is just above the upper coil of pipe. The calorimeter should stand on a table by the side of a sink so that the condensed water and hot water outlets overhang and deliver into the sink. A suitable change-over funnel may be constructed as follows:

A piece of india-rubber tube, reaching nearly to the base, should be attached to the waste water pipe so as to avoid splashing, and another piece may conveniently be slipped on to the condensed water outlet so as to lead the condensed water into a flask, but care should be taken than the small side-hole is not covered by the tube. A glass vessel must be provided, of the size of the vessel *D*, containing water in which is dissolved sufficient carbonate of soda to make it definitely alkaline. The calorimeter after use is lifted out of its vessel *D* and placed in the alkaline solution and there left until it is again required

for use. The liquid should not, when the calorimeter is placed in it, come within 2 inches of the top of the vessel. The liquid must be replenished from time to time, and its alkalinity must be maintained.

The above description of the Boys' calorimeter was taken from "The Notification of the Metropolitan Referees, for the year 1908."

The Simmance-Abady Gas Calorimeter.—This instrument consists of an outer casing, the interior of which is divided into a series of annular spaces, through which the hot gases from a Bunsen burner may pass. These gases flow out at a point at which a thermometer is placed for registering the temperature of the outflowing gases. A small damper is fitted to regulate the size of the opening past the thermometer. Each alternate annular space is closed at the bottom so as to form a container for the water inside the vessel. These water spaces are connected together at the top and bottom by small radial pipes. The hot gases from the burner rise and then pass down the spaces. The inflowing water enters at the cock and passes the thermometer, where its temperature is taken. From there it travels down the outer annular space, then through the radial pipes, up the next space, through the top radial pipes, down once more, then again through the radial pipes at the bottom, and up the last space to the top of the instrument, where its temperature is taken by another thermometer. After this it flows out through a pipe where there is a movable funnel, by means of which the water can be directed either into a graduated measure or can run to waste. There is a tube at the top of the instrument which forms a gauge to indicate the height of the water in the apparatus. At the point where the hot gases issue from the calorimeter there is a small pipe which conveys the water formed by combustion into a small graduated measure. The calorimeter is connected to a small ball-valve cistern, thus insuring a practically constant flow, and this flow should go on unceasingly, a pipe leading it away to waste after it has traversed the instrument. The gas passes through a central dial meter (having a long pointer and a plainly marked dial), through a sensitive balance-valve governor (to take up unusually violent pulsations), and thus to the burner, constantly burning in the calorimeter, and imparting the whole of its heat to the flowing water. Large, distinctly scaled thermometers show the temperatures of the inlet and outlet water, and the water and gas being both practically constant in flow, the temperature indications are reliable guides.

The Sargent Calorimeter.—The Sargent calorimeter consists essentially of a water heater, so arranged that the heat developed by the combustion of the gas will be entirely absorbed by a quantity of measured water. The outer casing of this calorimeter is jacketed with wood to prevent the radiation of heat. The interior is a combustion chamber for the gas, surrounded by a compartment containing the jacket water. The combustion chamber is high enough to allow a suitable flame to be inserted without its impinging upon any part of the instrument. The products of combustion rise to the upper interior, then are diverted down through a series of small tubes to the bottom, and pass out through an opening, the size of which is controlled by a damper. The water enters in an opening at the top of the calorimeter. In the first Sargent instrument the water passed down through and just inside of the outer shell, then up and down several times, surrounding the small tubes carrying off the products of combustion of the gas, finally leaving at the top on a level with the inlet. In the second instrument the course of the water was down adjacent so the outer shell, then up once, surrounding the combustion tubes, and passing in a direction opposite to the flow of the products of combustion. The water head was originally controlled by a gauge on the outlet, but later a fixed elevated weir was adopted for this purpose.

The outflowing water also leaves the calorimeter through a weir overflow, after passing through a controlling cock. The overflow passes to an automatic dumping-bucket, which is divided into 2 parts, 1 part connecting to an overflow or waste, the other passing the water to a measuring vessel. This dumping bucket is held in position by a keeper. The weight of the water in the full side tends to oscillate the bucket, so that the water will flow into the empty side and through another outlet to the empty receptacle. When the hand of the gas meter passes the zero point an electrical circuit is completed, which, passing through the solenoid, draws down the keeper, and allows the outlet water to automatically change from the full to the empty pail. With such a device the personal error is not only eliminated, but much of the work of the operator is done automatically, thereby allowing him more time for observing the temperatures and weighing the water delivered.

The gas meter is of the wet type, with a drum of $\frac{1}{5}$ of a cubic foot capacity per revolution. The dial is divided in hundredths of a cubic foot. The flow of gas from the meter to the burner is regulated by a small leather diaphragm governor, mounted on the top of the meter, at the gas outlet. The thermometers indicating the temperature of both the inlet and outlet water are side by side, on the same level, at the top of the calorimeter, thus enabling both to be easily and quickly read. These thermometers read in Fahr. degrees, and are subdivided to read to $\frac{1}{5}$ of 1°. There is a thermometer placed near the outlet damper to register the temperature of the outflow products of combustion. The water after passing through the calorimeter is caught in a copper vessel and weighed on platform scales. By weighing the discharged water and using Fahr. thermometers, no transformation of units is necessary to get the result in B.T. U.'s.

Appendix B.

Refers to the Use of the Boys' Calorimeter.[1]—This testing shall be made on such days as the controlling authority shall direct. The calorimeter to be used in testing the calorific power of the gas shall be one which has been examined and certified by the Gas Referees. A description of the calorimeter is given in Appendix.

In order to test the gas for calorific power, the gas shall first pass through a meter and a balance governor of the same construction as those on the photometer table. It shall then be led to the gas inlet in the base of the calorimeter. The gas shall be turned on and lighted, and the tap of the calorimeter shall be so adjusted as to allow the meter hand to make one turn in from 60 to 75 seconds. The water shall be turned on so that when the regular flow through the calorimeter has been established a little may pass the overflow of the funnel and trickle over into the sink. Water must be poured in through one of the holes in the lid until it begins to run out at the condensation outlet. The calorimeter may then be placed upon its base. The measuring vessel carrying the change-over funnel should then be placed in position in the sink so that the outlet water is led into the sink. The hot water outlet tube of the calorimeter should be above but should not touch the change over funnel. After an interval of not less than 30 minutes the Gas Examiner, after bringing the reading glasses into position on the thermometers used for measuring the temperature of the inlet and outlet water, shall then make the following observations: When the meter hand is at 75 he shall read the inlet temperature; when it reaches 100 he shall move the funnel so as to direct the outflow in the measuring vessel and at the same time he shall start the stopclock or a stopwatch. When the meter hand reaches 25 he shall make the first reading of the outlet temperature. He shall continue to read the outlet temperature at every $\frac{1}{4}$ turn until 15 readings have been taken. The meter hand will then be at 75. He shall also at every turn of the meter except the last make a reading of the inlet temperature when the meter hand is between 75 and 100. When the meter hand reaches 100, after the last outlet temperature has been read, the Gas Examiner shall shift the funnel so as to direct the outlet water into the sink again and at the same time stop the clock or watch. The barometer and the thermometers showing the temperatures of the effluent gas, of the air near the calorimeter and of the gas in the meter, shall then be read. The time shown by the stopclock shall be recorded. The mean of the 4 readings of the inlet temperature is to be subtracted from the mean of the 15 readings of the outlet temperature and the difference is to be multiplied by 3 and by the number of liters of water collected and the product is to be divided by the tabular number. The difference in degrees C. of the temperature of the effluent gas and of the surrounding air shall be taken, and $\frac{1}{4}$ of this difference shall be added to the result previously found if the effluent gas is the warmer of the two, or subtracted if the effluent gas is the cooler of the two.[2] The result is the gross calorific power of the gas in calories per cubic foot.

In addition to the observations described, the amount of condensed water resulting from the combustion of the gas shall be measured. For this purpose the condensation water shall be led into a flask not less than 20 minutes after the calorimeter has been placed in position. The amount collected in not less than 30 minutes shall be measured, the time of collection having been accurately noted.

The number of cubic centimeters shall be multiplied by the number of seconds in the time indicated by the stopclock and by the number 1.86. The number of seconds in the time during which the condensed

1. Notification of the Metropolitan Gas Referees (Year 1908), as to the mode of testing the calorific power of the gas.

2. This correction has been found by experiment.

water was being collected shall be multipulied by the tabular number. The first product shall be divided by the second. The quotient is to be subtracted from the gross calorific power. The difference is the net calorific power in calories per cubic foot. The gross and net calorific power in B.T.U.'s. can be obtained by multiplying the corresponding numbers of calories by 3.968.

Appendix C.

Tests of Dr. Immenkotter.—See "Ueber Heizwertbestimmungen mit besonderer Berueecksichtigung gasfoermiger und fluessiger Brennstoffe," by Theodor Immenkotter.—Press R. Oldenbourg, Berlin, 1905.

From a series of tests on the Junkers' gas calorimeter, Dr. Immenkotter arrives at the following conclusions:

1. That the combustion is perfect.
2. That the influence of radiation from the flame downwards is negligible, being at the most about ¾ B.T.U. per cubic foot.
3. That the conduction of heat by the burner stem plays no appreciable part, the stem being cool.
4. That the loss of heat to the surrounding air affects the heating value to the extent of no more than .03 per cent. per degree temperature difference between air and warmed water.
5. That heat carried off by the products of combustion (apart from water vapor) affects the readings of heating values only by .027 per cent., with an exact supply of air. to .12 per cent., with a 4-fold supply of air, per degree difference between the air and the spent gases.
6. That with regard to the moisture in the spent gases, these are found not to be saturated, but their temperature of saturation is found to be approximately the same as the temperature of the feed water.
7. That errors in the time of opening or shutting stopcocks mostly offset one another.
8. That weighing the water can be done quite exactly; that errors in temperature reading need not come to more than .01, which on a raise of 20° represents not more than .05 per cent.
9. The meter for measuring the gas burned needs to be verified.
10. That the estimation of the amount of water formed (which serves as a datum for computing the lower heating value of the gas) requires that the gas should be burned in the calorimeter for, say, ½ hour, 200 liters of gas burned in that time giving about 200 grammes of water contents.
11. That there is a combination which favors uniformity of heating of the water in respect that any water tube which happens to be colder than the rest has the colder portions of the waste products falling past it more rapidly, and *vice versa*.
12. That slight variations in the temperature of the feed water, or in the quantity of gas admitted, are slow in affecting the thermometers.
13. That the height of the flame should be watched, for it must not be allowed to vary.

Appendix D.—*U. W. Chem. Eng. Junkers, Series I.—Table of Test Data No.* 1.—*O. L. Kowalke*, 7-1-08.

	1	2	3	4	5	6	7	8	9	10
Barometer	29.23	29.23	29.23	29.22	29.22	29.22	29.22	29.22	29.21	29.22
Temperature gas	73.6	73.8	73.9	73.9	74.1	74.3	74.3	74.3	74.3	74.5
Correction factor	0.938	0.9376	0.9371	0.9367	0.9362	0.9357	0.9357	0.9357	0.9354	0.9353
Humidity	59.0	61.0	61.0	61.0	63.0	63.0	63.0	63.0	63.0	63.0
Room temperature	74.0	74.2	74.6	74.5	74.2	74.9	74.7	74.6	74.6	74.0
Exhaust temperature	77.0	77.5	77.5	77.5	78.0	78.0	78.0	78.0	78.0	79.0
Gas rate cubic foot hour	7.2	7.06	7.06	6.97	7.14	7.12	7.13	7.12	7.2	7.05
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—k'gms	3.442	3.441	3.452	3.439	3.452	3.381	3.385	3.373	3.374	3.371
Inlet temperature	74.254	74.357	74.458	74.56	74.852	74.946	75.039	75.349	75.803	76.082
Outlet temperature	89.734	89.778	89.848	89.996	90.175	90.573	90.584	90.968	91.409	91.702
Rise in temperature	15.48	15.421	15.390	15.436	15.323	15.627	15.545	15.619	15.606	15.62
B.T.U.	626.1	623.85	624.92	624.7	622.8	622.49	619.89	620.6	620.49	620.60

Boys Calorimeter, Series I.—Luminous Flame Used in All Tests—*R. C. Cornish*, 7-1-08.—*Table of Test Data No.* 2.

	1	2	3	4	5	6	7	8	9
Barometer	29.23	29.23	29.23	29.22	29.22	29.22	29.22	29.21	29.22
Temperature gas "F"	73.6	73.8	73.9	73.9	74.3	74.3	74.3	74.3	74.5
Correction factor	0.938	0.9376	0.9371	0.9367	0.9357	0.9357	0.9357	0.9354	0.9353
Humidity	59.0	59.0	61.0	61.0	63.0	63.0	63.0	63.0	63.0
Room temperature	74.0	74.2	74.6	74.5	74.9	74.75	74.65	74.8	74.7
Exhaust temperature	77.5	78.0	78.0	78.4	78.8	79.0	79.0	79.3	79.5
Gas rate cubic foot hour	3.75	3.69	3.72	3.80	3.73	3.72	3.70	3.66	3.66
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated –pounds	7.281	7.316	7.3699	7.233	7.3986	7.421	7.451	7.491	7.5419
Inlet temperature "C"	23.449	23.544	23.615	23.649	23.917	23.872	24.138	24.266	24.51
Outlet temperature "C"	32.143	32.077	32.198	32.385	32.424	32.358	32.592	32.633	32.818
Rise in temperature "F"	15.649	15.359	15.449	15.724	15.312	15.274	15.217	15.060	14.954
B.T.U.	607.4	607.4	607.5	607.1	605.4	605.8	606.3	604.1	602.4

U. G. I. Sargent (New) Series I.—Table of Test Data No. 3.

	1	2	3	4	5	6	7	8	9
Barometer	29 23	29.23	29.23	29.22	29.22	29.22	29.22	29.21	29.22
Temperature gas	73.6	73.8	73.9	73.9	74.3	74.3	74.3	74.3	74.5
Correction factor	0.9380	0.9376	0.9371	0.9367	0.9357	0.9357	0.9357	0.9354	0.9353
Humidity per cent	59.0	61.0	61.0	61.0	63.0	63.0	63.0	63.0	63.0
Room temperature	74.0	74.2	74.6	74.5	74.8	74.7	74.6	74.6	76.6
Exhaust temperature	76.0	76.0	76.0	76.5	77.0	77.0	77.0	77.0	78.0
Gas rate cubic foot hour	5.14	5.14	4.96	4.87	4.93	5.00	4.93	4.93	4.89
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—k'gms	3.415	3.450	3.490	3.479	3.403	3.379	3.363	3.360	3.364
Inlet temperature	74.303	74.405	74.556	74.609	75.096	75.006	75.552	75.738	76.19
Outlet temperature	89.617	89.568	89.55	89.665	90.394	90.409	91.01	91.102	91.509
Rise in temperature	15.314	15.163	14.994	15.056	15.298	15.403	15.458	15 364	15.319
B.T.U.	614.6	615.0	615.5	616.4	613.88	613.13	612.56	608.34	607.3

U. W. Junkers, Series E.—At Varying Gas Consumption per Hour with Rise in Temperatnre Maintained Constant.—*O. L Kowalke*, 6-26-08 P.M.—*Table of Test Data No.* 4.

	1	2	3	4	5	6	7	8	9
Barometer	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3
Temperature gas	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5
Correction factor	0.9307	0.9307	0.9307	0.9307	0.9307	0.9307	0.9307	0.9307	0.9307
Humidity	57.0	57.0	57.0	52.0	57.0	57.0	57.0	57.0	57.0
Room temperature	78.2	78.3	78.3	78.2	78.6	78.6	78.6	78.7	78.9
Exhaust temperature	76.0	76.5	76.0	76.5	76.3	76.5	76.0	76.0	76.0
Gas rate cubic foot hour hour	2.15	3.27	4.00	5.00	5.80	6.93	8.17	9.22	10.3
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—pounds	7.233	7.7554	7.193	7.361	7.502	7.400	7.509	7.550	7.131
Inlet temperature	72.915	72.731	72.549	73.441	72.766	72.71	72.651	72.63	72.529
Outlet temperature	89.149	88.434	89.073	89.644	88.760	88.723	88.479	88.535	88.945
Difference	16.234	15.703	16.524	16.203	15.994	16.210	16.018	15.905	16.416
B.T.U.	630.8	637.3	638.5	640.75	644.6	644.4	646.2	645.1	628.9

Boys' Calorimeter.—Series H.—Impossible to Maintain Constant Rise in Temperature on Account of Size of Coil.—Table of Test Data No. 5.

	1	2	3	4	5	6
Barometer	29.00	29.22	29.22	29.00	29.00	29.00
Temp. of gas	70.55	72.9	72.0	70.9	71.6	72.00
Correction factor	0.9401	0.9404	0.9402	0.9384	0.9366	0.9356
Humidity	65.0	61.0	61.0	69.0	69.0	69.0
Room temp.	72.5	74.0	74.0	72.85	73.8	74.25
Exhaust temp.	72.6	72.5	74.5	74.5	75.5	75.8
Gas rate, cu. ft. hr.	2.08	2.34	2.79	3.61	5.12	5.46
Gas cons'd—cu. ft.	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—lbs.	6.938	7.714	8.5141	7.961	5.997	5.67
Inlet temp. "C".	22.2	21.773	21.807	22.47	22.559	22.61
Outlet temp. "C".	30.8645	29.6765	29.092	30.313	32.949	32.415
Difference "F".	15.596	14.2263	13.113	14.1174	18.702	19.449
B.T.U.	575.4	583.5	593.7	598.7	598.7	589.3

U. W. Chem. Eng. Junkers.—Series K.—Table of Test Data No. 6.—7-2-08.

	1	2	3	4	5
Room temp.	74.65	74.65	74.9	75.2	75.3
Exhaust temp.	79.5	79.5	79.5	79.5	79.5
Time of test, mins.	3.0	3.0	3.0	3.0	3.0
Water heated, grms.	4,140.0	4,139.0	4,142.0	4,133.0	4,137.0
Temp. inlet "F".	72.679	72.662	72.692	72.71	72.68
Temp. outlet "F".	87.646	87.657	87.671	87.67	87.642
Rise in temp. "C".	8.315	8.3305	8.322	8.312	8.312
Volts heating coil	86.643	86.70	86.6977	86.645	86.555
Amps. heating coil.	9.295	9.2956	9.295	9.290	9.285
Small cals. put in	34,602.5	34,627.52	34,624 4	34,593.3	34,530.19
Small cals. observ'd	34,424.1	34,479.9	34,469.7	34,553.49	34,386.7
Present efficiency	92.48	99.57	99.55	99.30	99.58

Simmance-Abady, Series L.—Table of Test Data No. 7, July 7, 1908.

	1	2	3	4	5	6
Room temperature	75.0	75.0	75.5	76.0	75.5	76.0
Exhaust temperature	76.5	76.5	76.5	76.7	76.7	76.8
Water heated—grams	4,069.0	4,061.0	4,068.0	4,062.0	4,064.0	4,065.0
Inlet temperature "F"	73.139	73.654	73.662	73.659	73.677	73.697
Outlet temperature "F"	86.857	86.861	87.002	86.934	87.009	86.943
Rise in temperature "C."	7.625	7.337	7.411	7.375	7.4066	7.3589
Time of tests in seconds	180.0	180.0	180.0	180.0	180.0	180.0
Volts	94.8	94.73	94.70	94.65	94.6304	94.60
Amperes	6.8594	6.86	6.8619	6.861	6.862	6.862
Small calories put in	27,939.55	27,921.36	27,920.25	27,901.85	27,900.14	27,891.17
Small calories observed	31,009.84	29,796.369	30,147.95	29,957.25	30,100.42	29,915.92
Efficiency	110.99	106.72	107.98	107.36	107.88	107.26

Series M. M. G. L. Co. Junkers.—No. 2, U. W. Junkers.—Table of Test Data No. 8.—7-8-1908.

	6	7	8	9	10	6	7	8	9	10
Barometer	29.21	29.21	29.21	29.21	29.21	29.21	29.21	29.21	29.21	29.21
Temperature gas	76.37	76.37	76.37	76.37	76.37	76.37	76.37	76.37	76.37	76.37
Correction factor	0.9308	0.9308	0.9308	0.9308	0.9308	0.9308	0.9308	0.9308	0.9308	0.9308
Humidity per cent.	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
Room temperature	76.4	76.4	76.4	79.5	76.5	76.4	76.45	76.4	76.5	76.5
Exhaust temperature	77.0	77.0	77.0	77.0	77.0	77.2	77.2	77.3	77.3	77.3
Gas rate cubic foot hour	7.12	7.12	7.06	7.00	7.07	7.07	7.07	7.07	7.07	7.07
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—pounds	7.2774	7.2377	7.2686	7.2708	7.2619	7.478	7.372	7.363	7.403	7.374
Inlet temperature	74.276	74.285	74.307	74.341	74.404	74.188	74.19	74.228	74.254	74.304
Outlet temperature	89.833	89.886	89.892	89.953	90.007	89.467	89.658	89.755	89.749	89.861
Rise in temperature	15.557	15.601	15.585	15.612	15.603	15.279	15.468	15.527	15.495	15.557
B.T.U.	608.15	606.55	608.51	609.75	608.65	613.75	612.55	614.16	616.19	616.7

M. G. L. Co. Junkers, Series M.—U. W. Chem. Eng. Junkers.—Table of Test Data No. 9.—7-8-1908.

	1	2	3	4	5	1	2	3	4	5
Barometer	29.23	29.23	29.23	20.23	29.23	29.23	29.23	29.23	29.23	29.23
Temperature of gas	75.92	75.92	75.92	75.92	75.92	75.92	75.92	75.92	75.92	75.92
Correction factor	0.9344	0.9344	0.9344	0.9344	0.9344	0.9344	0.9344	0.9344	0.9344	0.9344
Humidity	56.0	56.0	56.0	59.0	59.0	56.0	56.0	56.0	59.0	59.0
Temperature room	76.0	76.0	76.0	76.0	76.1	76.0	76.0	76.0	76.0	76.1
Temperature exhaust gas	76.0	76.0	76.0	76.0	76.1	76.8	76.8	76.8	77.0	77.0
Rate of gas cubic foot hour	7.06	7.06	7.06	7.13	7.02	7.01	7.00	7.02	7.02	7.01
Gas consumed cubic feet	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—pounds	7.3612	7.3545	7.3633	7.3369	7.3520	7.372	7.392	7.3656	7.3788	7.3678
Inlet temperature	73.557	73.601	73.638	73.702	73.712	73.488	73.532	73.577	73.620	73.655
Outlet temperature	88.980	89.034	89.060	89.188	89.1247	89.012	89.059	89.127	89.153	89.202
Difference	15.423	15.433	15.422	15.486	15.503	15.524	15.527	15.550	15.533	15.547
B.T.U.	607.51	607.35	607.63	607.98	609.89	612.39	614.17	612.88	613.31	612.95

Junkers.—Series P.—Table of Test Data No. 10.

	1.	2.	3.	4.	5.	6.
Barometer	29.09	29.09	29.09	29.09	29.09	29.09
Temperature gas	73.04	73.13	73.22	73.31	73.4	73.4
Correction factor	0.9359	0.9355	0.9353	0.935	0.9348	0.9348
Room temperature	74.65	74.9	74.9	74.9	74.95	75.0
Exhaust temp.	74.0	....	....	....	....	....
Gas rate, cu. ft. hr.	7.07	7.07	7.07	7.07	7.07	7.07
Gas cons'd—cu. ft.	0.2	0.2	0.2	0.2	0.2	0.2
Water heated—lbs.	6.8717	6.8563	6.8519	6.8563	6.8585	6.8695
Inlet temperature	69.888	69.98	70.064	70.182	70.306	70.395
Outlet temp.	85.572	85.66	85.758	85.873	85.991	86.065
Difference "F"	15.684	15.68	15.694	15.691	15.685	15.670
B.T.U.	575.8	574.6	574.8	575.3	575.2	575.7

Simmance-Abady.—Series P.—Table of Test Data No. 11.

	1.	2.	3.	4.	5.	6.
Barometer	29.09	29.09	29.09	29.09	29.09	29.09
Temperature gas	73.04	73.13	73.22	73.31	73.4	73.4
Correction factor	0.9359	0.9355	0.9353	0.935	0.9348	0.9348
Room temperature	74.65	74.9	74.9	74.9	74.95	75.0
Exhaust temp.	75.0	75.0	74.9	74.9	74.9	74.9
Gas rate, cu. ft. hr.	4.08	4.08	4.08	4.08	4.08	4.08
Gas cons'd—cu. ft.	0.2	0.25	0.2	0.2	0.2	0.2
Water heated—lbs.	7.2046	8.9926	7.2046	7.2068	7.1782	7.1826
Inlet temperature.	69.948	70.022	70.118	70.283	70.380	70.454
Outlet temp.	86.455	86.331	86.331	86.651	86.836	86.777
Difference "F"	16.507	16.309	16.213	16.368	16.456	16.323
B.T.U.	635.3	627.1	624.4	630.8	631.8	627.1

APPENDIX E.—*Order of Cuts.*

A.—Chart Series, as listed.
Fig. 1—General view of Junkers' calorimeter, with accessories.
Fig. 2—Junkers' calorimeter. Sectional view and elevation.
Fig. 3—Boys' calorimeter. Sectional view.
Fig. 4—Simmance-Abady calorimeter. Sectional views.
Fig. 5—General view of final Sargent calorimeter, with accessories.
Fig. 6—The first Sargent calorimeter. Sectional views and elevation.
Fig. 7—The first Sargent calorimeter. Sectional view.
Fig. 8—Electric heater used in efficiency tests.
Fig. 9—General view of modified Junkers' calorimeter, with accessories. Laboratory of Milwaukee Gas Light Company.
Fig. 10—Heating value computer. For calculating the corrected heating value of a gas from calorimeter readings.
Fig. 11—Correction factors for temperature and pressure.
Fig. 12—Curves showing percentage of relative humidity from wet-and-dry bulb thermometer readings.

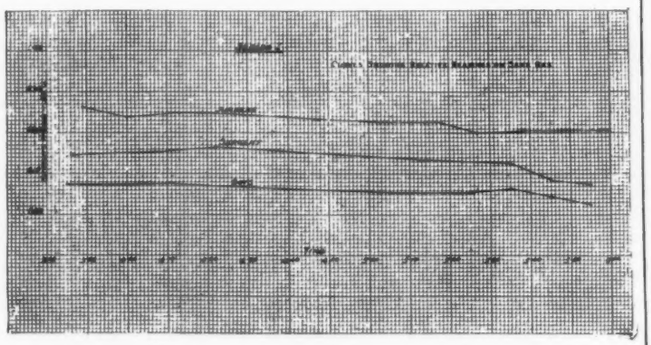
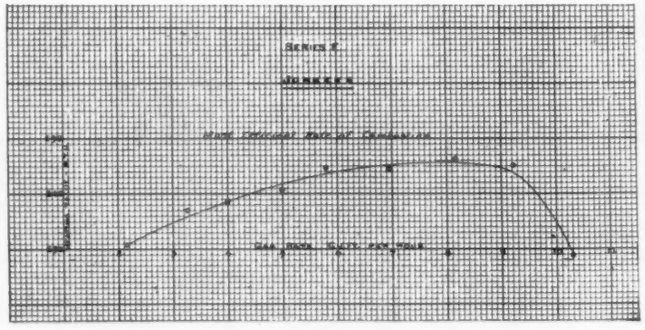


Chart No. 1.



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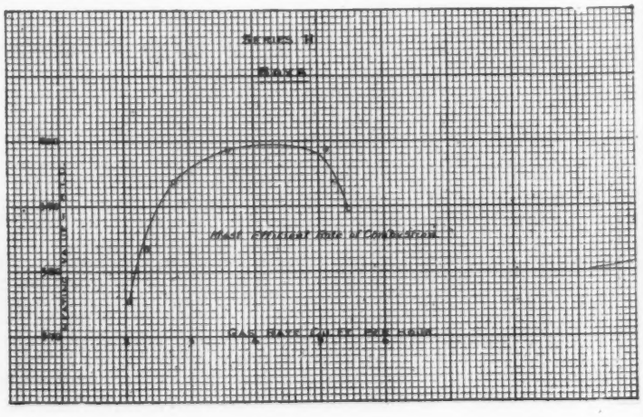

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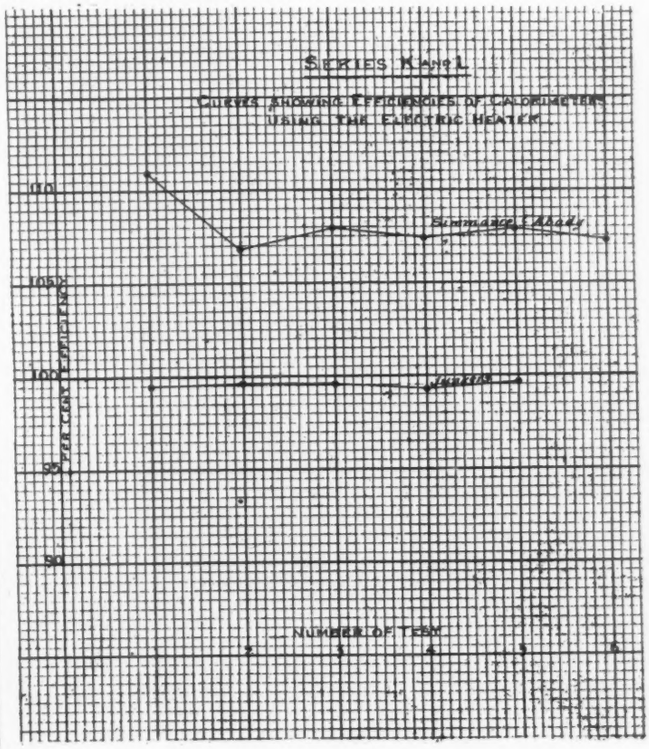

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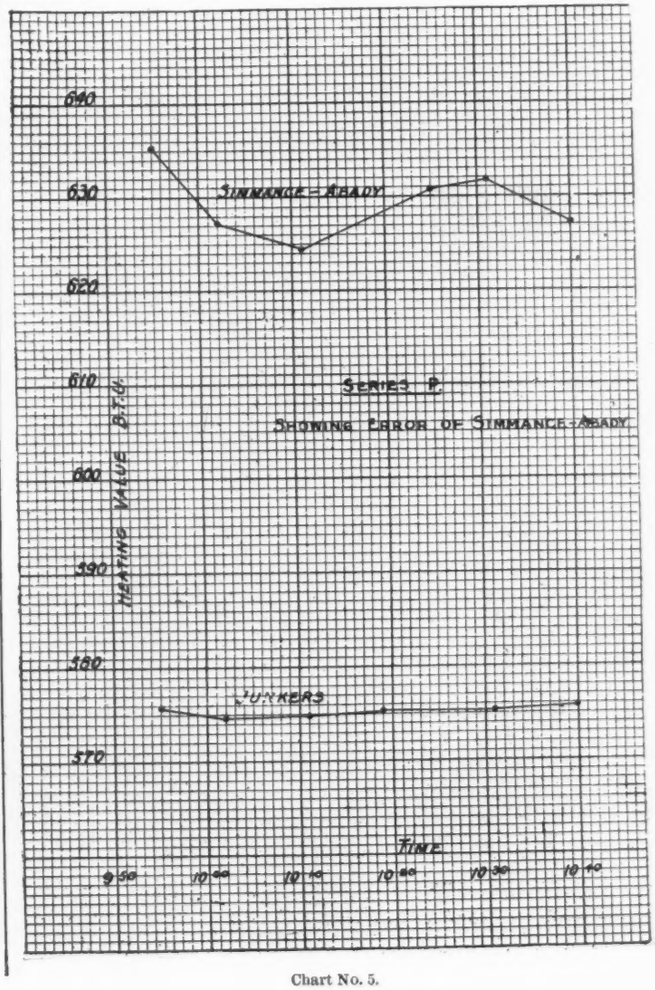

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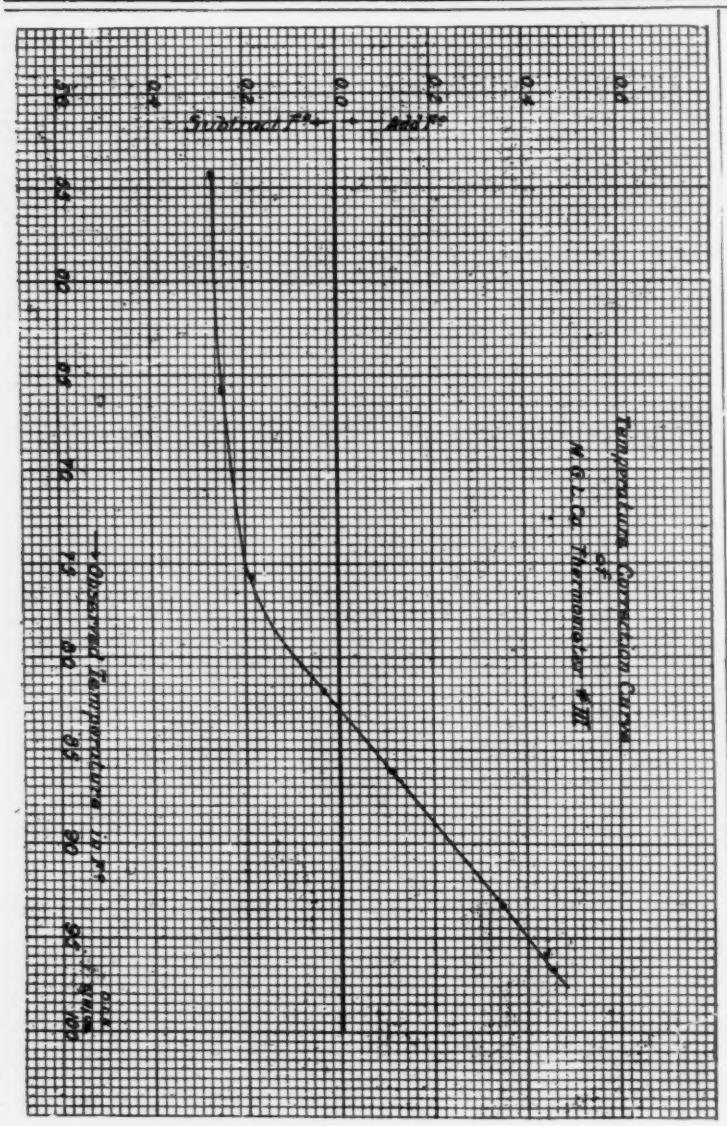

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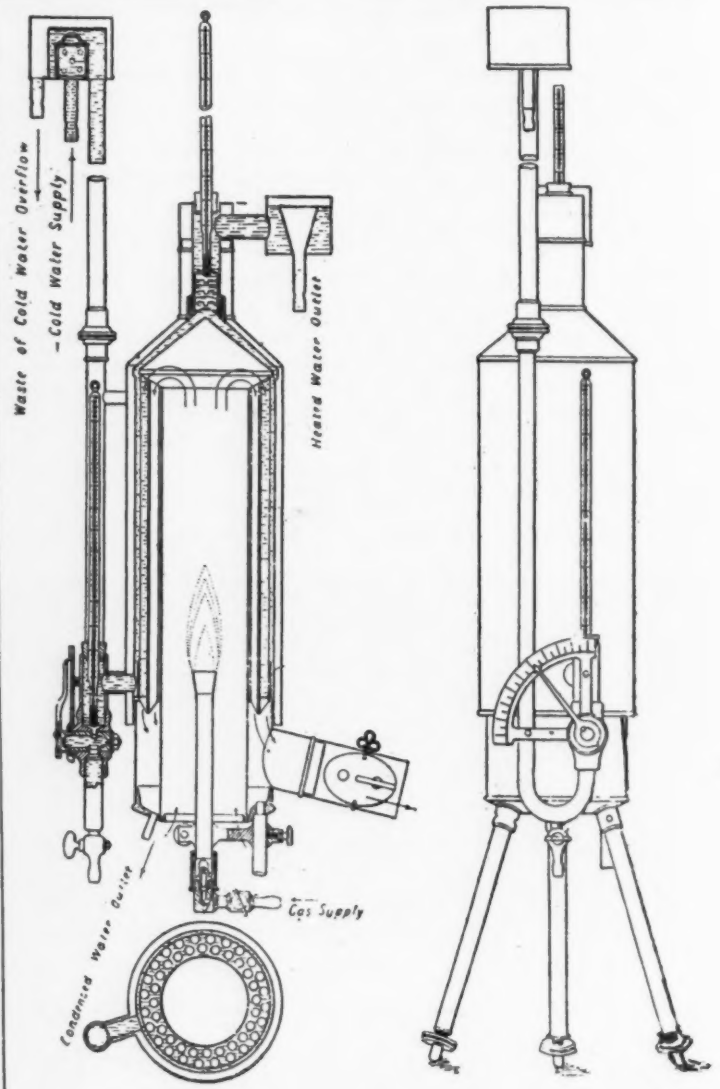


Fig. 2.

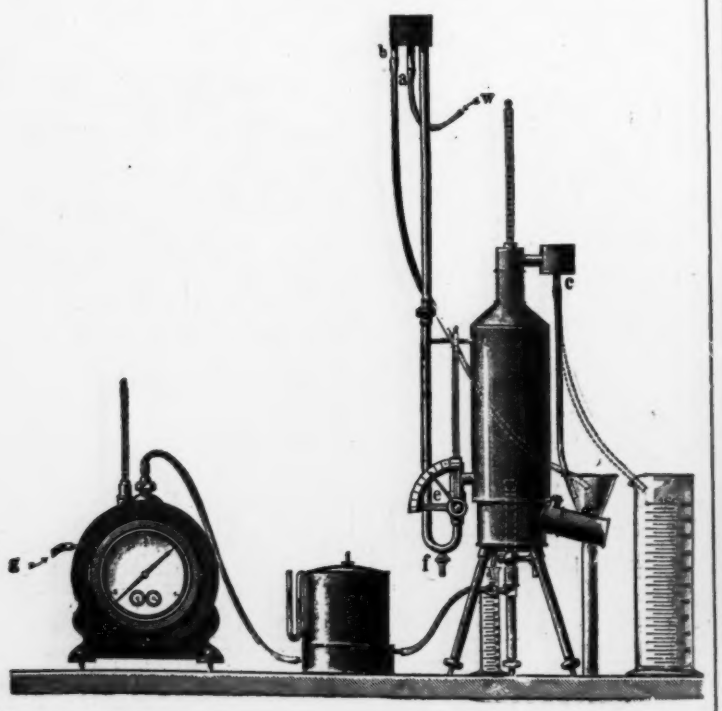
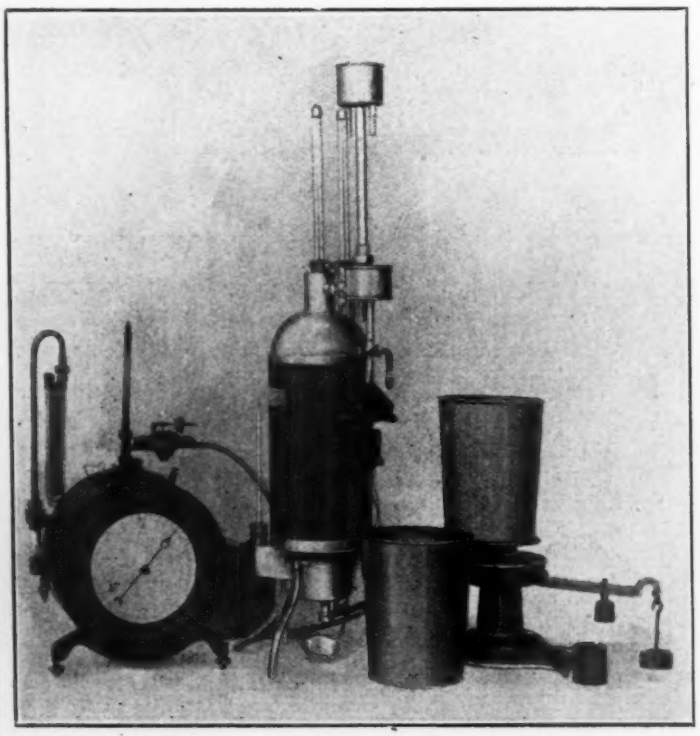


Fig. 1.



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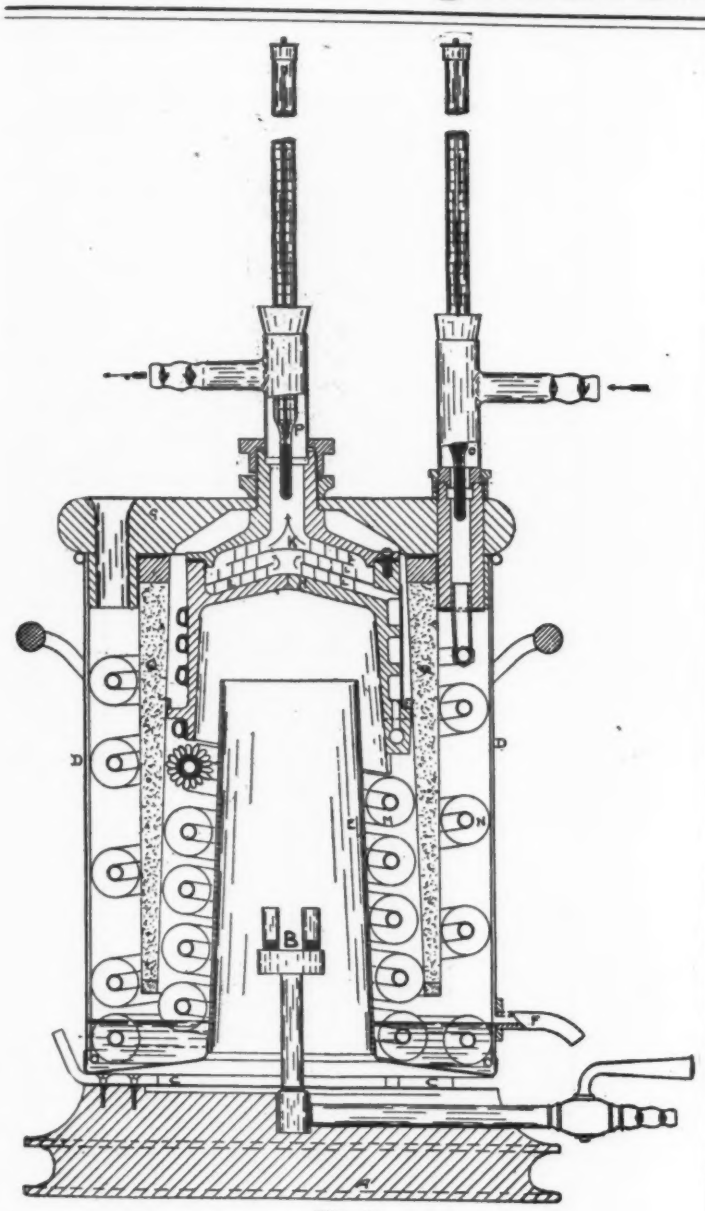
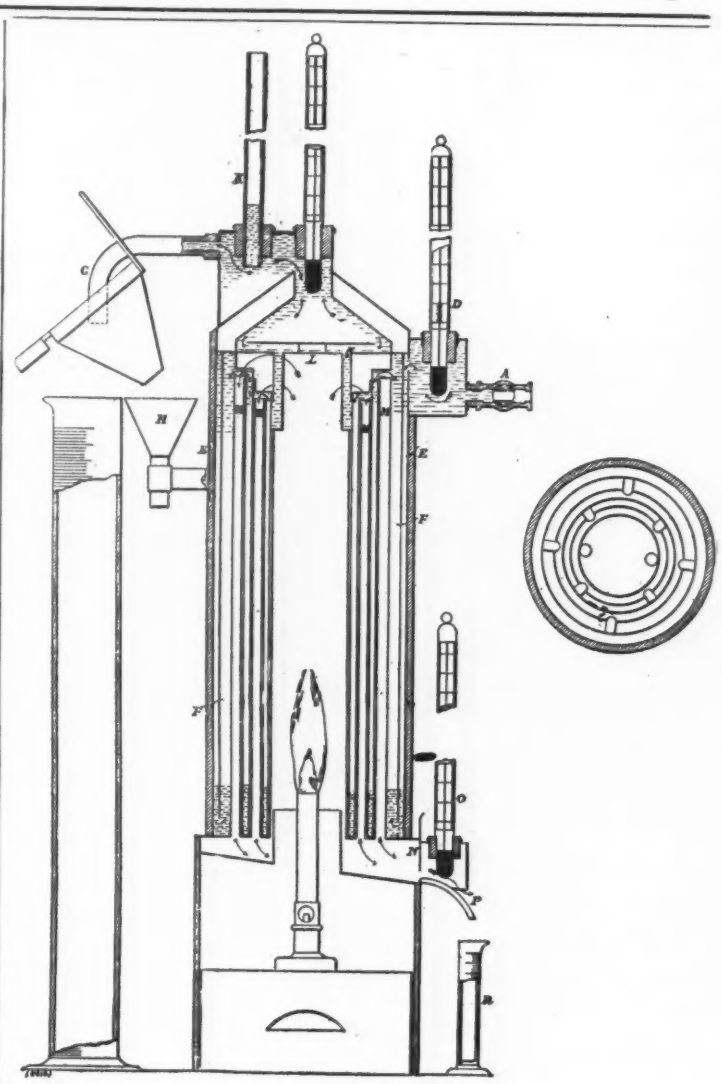


Fig. 3.



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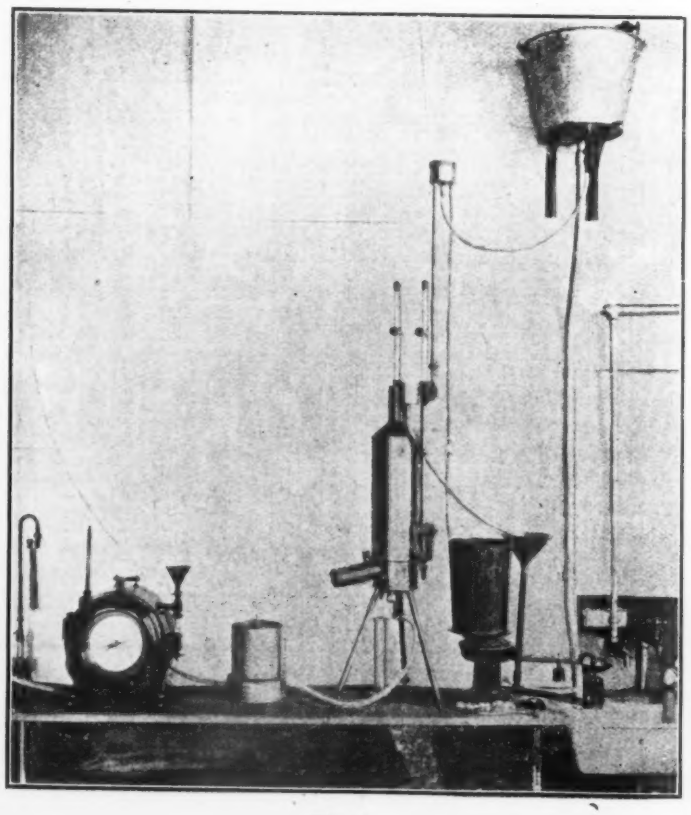

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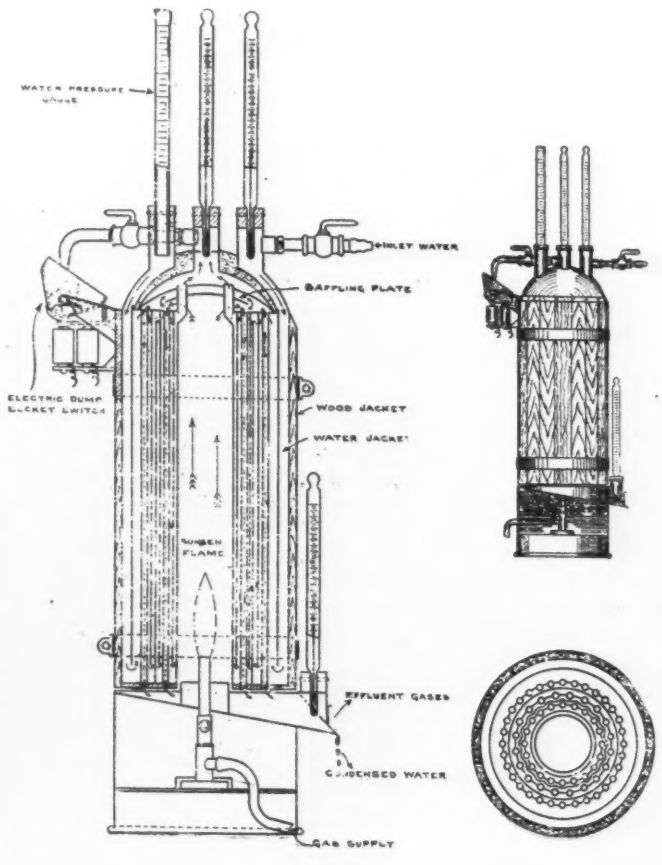

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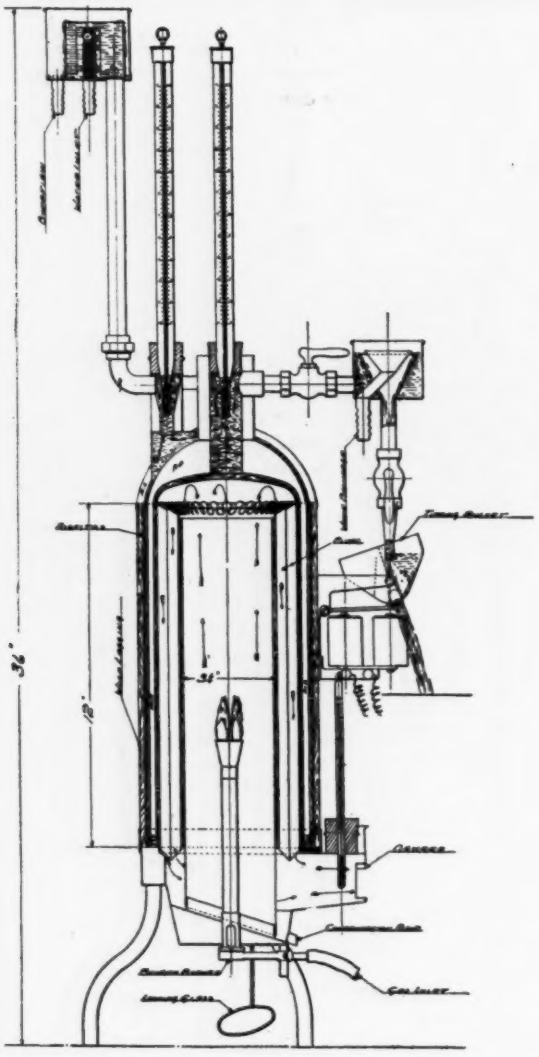

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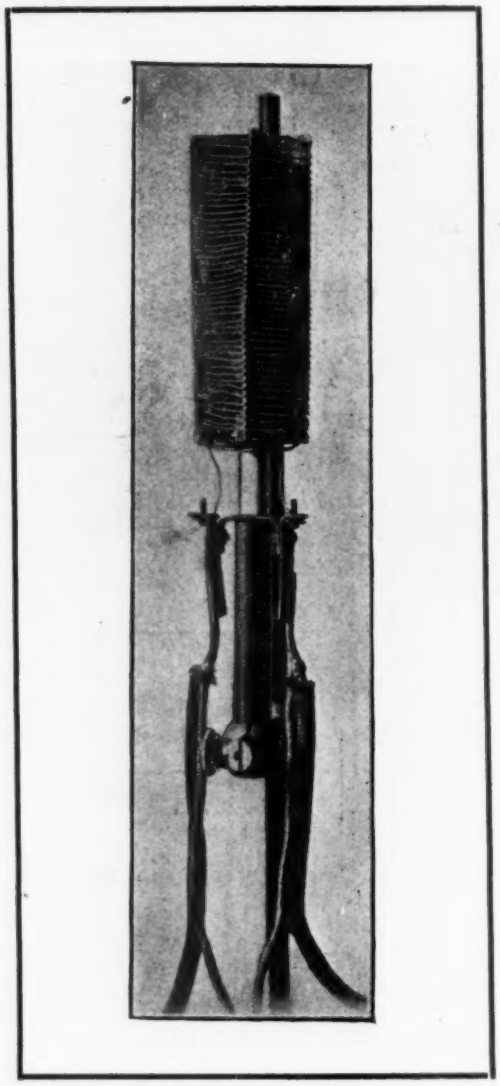

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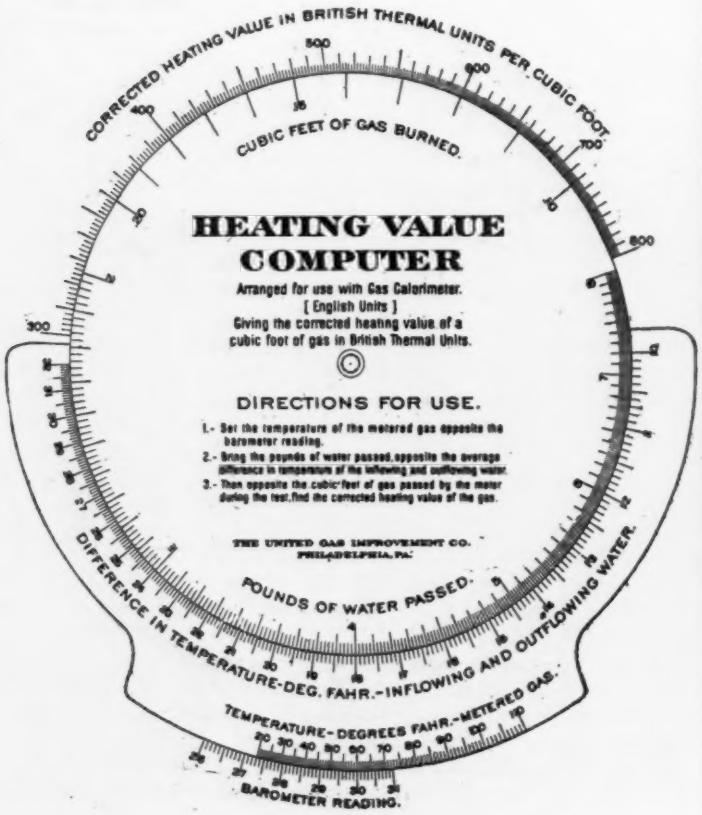
CORRECTED HEATING VALUE IN BRITISH THERMAL UNITS PER CUBIC FOOT.
CUBIC FEET OF GAS BURNED.
HEATING VALUE COMPUTER
Arranged for use with Gas Calorimeter.
[English Units]
Giving the corrected heating value of a cubic foot of gas in British Thermal Units.
DIRECTIONS FOR USE.
1.- Set the temperature of the metered gas opposite the barometer reading.
2.- Bring the pounds of water passed opposite the average difference in temperature of the inflowing and outflowing water.
3.- Then opposite the cubic feet of gas passed by the meter during the test find the corrected heating value of the gas.
THE UNITED GAS IMPROVEMENT CO.
PHILADELPHIA, PA.
POUNDS OF WATER PASSED.
DIFFERENCE IN TEMPERATURE-DEG. FAHR.-INFLOWING AND OUTFLOWING WATER.
TEMPERATURE-DEGREES FAHR.-METERED GAS.
BAROMETER READING.

Fig. 10.

BAROMETER

TEMPERATURE	29.6	29.7	29.8	29.9	30.0	30.1	30.2	30.3	30.4	30.5	30.6
95	.957	.961	.964	.968	.972	.976	.979	.983	.987	.991	.994
94	.959	.963	.966	.970	.974	.977	.981	.985	.989	.992	.996
93	.961	.965	.968	.972	.976	.979	.983	.987	.990	.994	.998
92	.963	.967	.970	.974	.978	.981	.985	.989	.992	.996	1.000
91	.965	.969	.972	.976	.980	.983	.987	.991	.994	.998	1.002
90	.967	.971	.974	.978	.982	.985	.989	.993	.996	1.000	1.004
89	.969	.973	.976	.980	.984	.987	.991	.995	.998	1.002	1.006
88	.971	.975	.978	.982	.986	.989	.993	.997	1.000	1.004	1.008
87	.973	.977	.980	.984	.988	.991	.995	.999	1.002	1.006	1.010
86	.975	.979	.982	.986	.990	.993	.997	1.001	1.004	1.008	1.012
85	.977	.981	.984	.988	.992	.995	.999	1.003	1.006	1.010	1.014
84	.979	.983	.986	.990	.994	.997	1.001	1.005	1.008	1.012	1.016
83	.981	.985	.988	.992	.996	.999	1.003	1.007	1.010	1.014	1.018
82	.983	.987	.990	.994	.998	1.001	1.005	1.009	1.012	1.016	1.020
81	.985	.989	.992	.996	1.000	1.003	1.007	1.011	1.014	1.018	1.022
80	.987	.991	.994	.998	1.002	1.005	1.009	1.013	1.016	1.020	1.024
79	.989	.993	.996	1.000	1.004	1.007	1.011	1.015	1.018	1.022	1.026
78	.991	.995	.998	1.002	1.006	1.009	1.013	1.017	1.020	1.024	1.028
77	.993	.997	1.000	1.004	1.008	1.011	1.015	1.019	1.022	1.026	1.030
76	.995	.999	1.002	1.006	1.010	1.013	1.017	1.021	1.024	1.028	1.032
75	.997	1.001	1.004	1.008	1.012	1.015	1.019	1.023	1.026	1.030	1.034
74	.999	1.003	1.006	1.010	1.014	1.017	1.021	1.025	1.028	1.032	1.036
73	1.001	1.005	1.008	1.012	1.016	1.019	1.023	1.027	1.030	1.034	1.038
72	1.003	1.007	1.010	1.014	1.018	1.021	1.025	1.029	1.032	1.036	1.040
71	1.005	1.009	1.012	1.016	1.020	1.023	1.027	1.031	1.034	1.038	1.042
70	1.007	1.011	1.014	1.018	1.022	1.025	1.029	1.033	1.036	1.040	1.044
69	1.009	1.013	1.016	1.020	1.024	1.027	1.031	1.035	1.038	1.042	1.046
68	1.011	1.015	1.018	1.022	1.026	1.029	1.033	1.037	1.040	1.044	1.048
67	1.013	1.017	1.020	1.024	1.028	1.031	1.035	1.039	1.042	1.046	1.050
66	1.015	1.019	1.022	1.026	1.030	1.033	1.037	1.041	1.044	1.048	1.052
65	1.017	1.021	1.024	1.028	1.032	1.035	1.039	1.043	1.046	1.050	1.054
64	1.019	1.023	1.026	1.030	1.034	1.037	1.041	1.045	1.048	1.052	1.056
63	1.021	1.025	1.028	1.032	1.036	1.039	1.043	1.047	1.050	1.054	1.058
62	1.023	1.027	1.030	1.034	1.038	1.041	1.045	1.049	1.052	1.056	1.060
61	1.025	1.029	1.032	1.036	1.040	1.043	1.047	1.051	1.054	1.058	1.062
60	1.027	1.031	1.034	1.038	1.042	1.045	1.049	1.053	1.056	1.060	1.064
59	1.029	1.033	1.036	1.040	1.044	1.047	1.051	1.055	1.058	1.062	1.066
58	1.031	1.035	1.038	1.042	1.046	1.049	1.053	1.057	1.060	1.064	1.068
57	1.033	1.037	1.040	1.044	1.048	1.051	1.055	1.059	1.062	1.066	1.070
56	1.035	1.039	1.042	1.046	1.050	1.053	1.057	1.061	1.064	1.068	1.072
55	1.037	1.041	1.044	1.048	1.052	1.055	1.059	1.063	1.066	1.070	1.074
54	1.039	1.043	1.046	1.050	1.054	1.057	1.061	1.065	1.068	1.072	1.076
53	1.041	1.045	1.048	1.052	1.056	1.059	1.063	1.067	1.070	1.074	1.078
52	1.043	1.047	1.050	1.054	1.058	1.061	1.065	1.069	1.072	1.076	1.080
51	1.045	1.049	1.052	1.056	1.060	1.063	1.067	1.071	1.074	1.078	1.082
50	1.047	1.051	1.054	1.058	1.062	1.065	1.069	1.073	1.076	1.080	1.084

Observed Volume Multiplied by Factor Corresponding to Observed Temperature and Barometric Pressure Equals Corrected Volume.

Fig. 11.

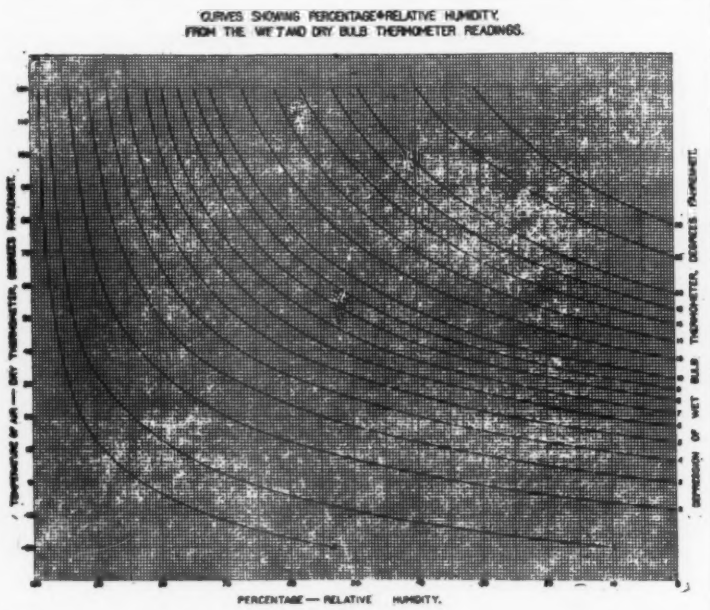
CURVES SHOWING PERCENTAGE RELATIVE HUMIDITY
FROM THE WET AND DRY BULB THERMOMETER READINGS.
TEMPERATURE OF AIR — DRY THERMOMETER, DEGREES FAHRENHEIT.
DEPRESSION OF WET BULB THERMOMETER, DEGREES FAHRENHEIT.
PERCENTAGE — RELATIVE HUMIDITY.

Fig. 12.

APPENDIX F.

Bibliography.—This appendix is a reporting of authorities on this subject, comprising 21 references in the regular publications devoted to the gas industry, the naming of 4 text books; and a history of 6 American patents.

The Responsibilities of the Manager.

[A paper read by MR. RICHARD SCHADDELEE, General Manager, Child, Hulswit & Co., at the Grand Rapids Convention of the Company's General Managers.]

As you will note from the titles of the various addresses of this, our first meeting, the subjects we have chosen all have relation to your duties and work in their broader aspects. This is especially true of the subjects chosen by the members of Child, Hulswit & Co. This was done advisedly. as we considered it of vital importance that at this first meeting we discuss together in a friendly spirit the fundamental principles and qualifications necessary for your and our success in the responsible positions you occupy. I said that you occupy responsible positions, and just how responsible your positions are I desire to bring out as strongly as I am able.

Your responsibilities are in 6 directions, namely: Towards your employers, your customers, the public, your creditors, your employees and yourself. Now, on careful analysis you will find that your every action, every word you say, and every letter you write, in the performance of your duties, directly concerns your responsibility in one or more of these 6 directions. You will also find that your responsibility towards your employers is the most important, and really comprises the other five. You can be positive that you cannot neglect or shirk your responsibility towards your customers, the public, your creditors, your employees or yourself without affecting your responsibility towards your employers. You can also be sure that, to the extent you prove yourself worthy of and equal to these responsibilities, you prove yourself worthy of your responsibilities towards your employers.

The Companies under your management represent investments of from $75,000 to $1,000,000, and of these properties you gentlemen are the local trustees, and upon you depends very largely their future success.

These properties are owned by numerous bond and stockholders, and they, the owners, are in fact your employers, Child, Hulswit & Co. merely acting as agents and representatives for all owners of bonds and stocks outside of their own holdings. Now, the fact that the owners of these properties have placed you in practically absolute charge of the properties representing such large investments, shows that they have confidence in your technical ability to administer and manage their business, and it gives them unquestionable right to expect of you absolute honesty and integrity, as well as great energy and application in the discharge of your duties. You, by accepting the positions you hold, have bound yourself, legally and morally, to guard the business and property entrusted to your care just as sacredly and carefully as if you were sole owners of them. Mind that your responsibilities comprise not merely the conservation of the properties you manage, but also their development to the highest possible point of efficiency. This is well illustrated by the parable of the faithful and the false steward in the New Testament.

Your acceptance of the position also constitutes the specific claim on your part to your employers, that you possess the necessary qualifications and ability to successfully manage their property, and your solemn covenant to guard the interests and property of your employers with absolute integrity and fidelity.

Now, independent of your qualifications for the particular industry you are engaged in, which are, of course, necessary for success in your position, certain qualities are indispensable to any person who administers any business belonging to others, and these qualities have no specific relation to the nature of the business itself.

As manager of another man's property you must be absolutely honest, not only with your employers, but also with your consumers and your employees. Meaning here by honest not only that you must not appropriate any money or property entrusted to your care for your own use, but more especially that you be honest in all statements you make, honest in the reports you send to this office, honest in your dealings with the public, your consumers, your creditors and your employees. Besides the responsibility of being honest in all your actions and dealings, you have also assumed the responsibility of being careful and accurate. You are to be careful in all your statements and reports and accurate in the keeping of your accounts and in the execution of all the duties of your office. You are also to be diligent, not only in the employment of your time, but also in the employment of your ability and energy, giving to your employers the best there is in you.

You are to be frugal and economical, not spending a dollar of your company's money for any purpose unless you are positive that the company's interests will be promoted by the expenditure; and this applies with just as much force to money invested in stocks or construction as to money paid out for operating expenses. I am afraid that in the past you have been prone to devote all of your attention to the earnings and operating expenses shown on your monthly reports, and not sufficient time to the analysis of your stocks, construction, accounts receivable and accounts payable figures.

Your responsibility as to the frugality and economy in the management of your company is implied by the very title of your position, for one of the definitions of the word "Manager," as given by Webster, is as follows: "A person who conducts business with economy and frugality; a good economist." You have also assumed the responsibility of being loyal and obedient to your employers; loyal to their best interests, and obeying any instructions they may give you for your guidance. Naturally, you would not be bound to carry out any instructions that would involve you in anything dishonest or dishonorable, but as we never have and never will give you instructions of this character, we need not discuss this.

You are to be energetic, prompt and progressive. Your title of manager also implies your responsibility to train and govern your employees and to treat your customers and the public with judgment, for these qualities are also defined under the word manager.

Now, all of the above named qualifications of honesty, integrity, frugality, economy, tenacity, energy, application, loyalty, obedience, fidelity and truthfulness are necessary to everyone who manages another mans property and business for a compensation, independent of the amount of the compensation or the nature of the business. You will also observe that your responsibility as to exercising the above named qualities commenced the minute you assumed your position, and that it depends entirely upon yourself and not upon conditions over which you have no control. Coming now to the particular business you are engaged in, you have accepted the responsibility of selling the largest amount of gas possible, and to produce same at the lowest cost possible at the burner, compatible with the delivery of a good quality of gas and the maintenance of good service to your customers.

Your employers, therefore, have a right to expect that you have the necessary technical knowledge to do this, and if for any reason there are local conditions that make this impossible, you must bring these conditions promptly to their attention.

Now, as to your responsibility in regard to the details of your business. Your responsibility exists in obtaining the best results possible in every one of your departments, taking into consideration local conditions of climate, character of population, size of city, cost of labor

and supplies, competition, etc. Most of the obstacles to low operating results can be overcome, either partly or entirely, by able, persistent and energetic work, and in a longer or shorter time, while others are fixed and not removable by any efforts of yours. So in these directions your responsibility covers the employment of your utmost energy and ability to produce the best results possible. Other of your responsibilities connected with the details of your business are entirely or largely under your control, such as amount of money you have invested in stocks, the collection of your bills, the prompt payment of your bills, the charging of your accounts, the accuracy of your books and reports, the employment of the utmost caution to prevent accidents and injury to both property and life, the courtesy of your employees, the prompt attention to complaints, etc., and in items of this character your responsibility is definite, except when your orders and rules are violated without your knowledge by either your employees or the public.

The enumeration of all your responsibilities in detail is beyond the scope of any one paper, and I have merely tried to outline the fundamental principles underlying the responsibilities of your positions as managers. Not with the idea that you will be overwhelmed and discouraged by them, but with the expectation that I would give you a keener sense of pride in the fact that you, out of so many thousands, have been selected to fill such responsible positions, and to encourage an added determination on your part to prove yourselves worthy of the confidence and trust the owners of these companies have reposed in you.

Items of Interest
FROM VARIOUS LOCALITIES.

WE recently heard it said by a gentleman who visited the new power plant of the Oakland (Cal.) Gas Light and Heat Company, at the foot of Jefferson street, Oakland, that it is a beauty. Mr. Britton and his associates add that it is also up to every duty that it was calculated to perform.

THE Fairview Gas Company, of West Virginia, to operate mainly in the Paw Paw district of Marion county, in the State named, has been incorporated by Messrs. H. S. Barnett, J. E. Parish, S. Tennant and E. G. Price. The initial capitalization is $25,000. The promoters are uncertain yet as to their own purposes, which certainly goes to show that some people are prompt to take time by the forelock.

THE literary division of the H. Mueller Manufacturing Company, of Decatur, Ills., has been at it again and with the usual results—satisfactory in every respect. This time the issue is a little booklet—come to think of it, all booklets are little—and it has the title "It's in the Wings." It treats of the Company's non-fouling check valve, which is finding much favor.

"THE annual ball of the employees of the Denver Gas and Electric Company was successfully brought off the night of the 27th ult.; the assembly was in Cotillion Hall, and the affair was in every sense a glowing success. Anyone of the rank-and-file who doubts this may and will secure ample verification thereof by writing to Mr. M. E. Malone, whose good lady and fair other half has the step of a fairy. On the other hand, any other gas company that needs a pair to properly lead its grand march should communicate with Mr. and Mrs. John T. Brady. Another gentleman who seemed to enter thoroughly into the spirit of the dance was Mr. Frank W. Frueauff, in whose philosophy there's more than enters into sordid computations of bond and stock values, not that he is in any sense backward over these reassuring things. Mr. William P. Troth, too, in his capacity as Chairman of the 'dearest committee,' also gave a noble account of himself. In fact, everybody seemed contented; yea, not only contented, but happy.—L. B."

MR. B. C. SNIPES and associates have applied to the City Council, Georgetown, S. C., for a franchise under which they propose to construct and operate a gas plant in that city. The matter was referred to a special committee of three—the Mayor and Alds. Harvey and Colbert.

MR. ARTHUR F. BIGELOW has resigned the post of Superintendent to the Allentown (Pa.) Gas Company. He entered its service in 1886, or when the plant was taken over by the United Gas Improvement Company. Mr. W. F. Broadnax, Assistant Superintendent, will likely be appointed to succeed Mr. Bigelow.

THE Massachusetts Board of Gas and Electric Light Commissioners have granted permission to the proprietors of the Norwood (Mass.) Gas Light Company to issue $82,000 additional new stock at par, to pay up floating debt remainders, etc.

AT a meeting of the shareholders of the Massachusetts Gas Companies, held the 1st inst., it was voted to ratify the purchase of the plant and properties of the North Adams, the Adams and the Williamstown Gas Light Companies; also, those of the Stamford (Vt.) Light, Heat and Power Company. It was further voted to issue new stock, to be sold at a price not less than 105. The proposed issue has been underwritten by Messrs. Jose, Parker & Co., of Boston.

THE New Business Department of the Peoples Gas Light and Coke Company proposes to organize a corps of inspectors, complaint people, etc., the members whereof are to be women. They will, of course, be instructed in the line of making suggestions as to the repairs of ranges, mantle lamps, and the way to manage and upkeep a sensible use of gas on domestic account. The Company has tried out this thing on a fairly large scale, and it has been found to work so well that the corps is to be increased. Those who visited the gas appliance exhibition in Chicago last week had an excellent opportunity to see how the arrangement works out in practice, for the Peoples Company's especial exhibit was "manned" partly by women folks.

PAMPHLET No. 082, recently put out by the C. W. Hunt Company, of New York, has to do with a nicely illustrated text description of the values of "Stevedore" manila rope for transmission uses.

MR. R. W. HILGENSTOCK, formerly connected with The Gas Machinery Company, of Cleveland, O., has resigned from its service in order to assume the position of Manager of the ammonia division of the great chemical house of Heinrich Hirzel, Leipzig-Plagwitz, Germany. He is a most estimable gentleman, and the only reason for his return to his native land is that he could not, from a business point of view, decline the financial consideration offered him to make the change.

MRS. HELEN ARMSTRONG, who is now regularly attached to the business staff of the Peoples Gas Light and Coke Company, of Chicago, in the position of Chief Demonstratress in the domestic division, issued an invitation to every woman in Chicago who changed her name as the result of a wedding ceremony, during the last 6 months, to be present on "Bride's Day" at the Appliance Exhibition, in Chicago last week. Mrs. Armstrong's topic was "The Heart of the Home," and her purpose was to show that a gas range in the kitchen was the one thing absolutely needed to keep that heart pulsing in steady, unintermitting state. Her showroom or booth was beyond doubt the center of attraction the opening day (8th inst.), and the crowds that witnessed her demonstrations certainly went to show cupid was busy in Chicago during 1908.

MESSRS. C. S. WHITCOMB, C. A. Weaver, W. S. Taylor, J. A. Jones and W. P. Nye are interested in the project to establish a gas plant in Glendora, Cal. It is thought that $30,000 will be sufficient to build a plant, complete; at any rate, that figure was the one submitted to them on such account, after an examination of the situation, by Mr. Z. T. Bell, whom our informant declares is a gas engineer resident in San Bernardino, Cal.

The Globe and Commercial Advertiser, of Manhattan Borough, gives quite some attention to the reporting of daily events in Richmond Borough, which, of course, is the appellation given to that portion of Greater New York, formerly known familiarly as Staten Island. In furthering the collection of Richmond news' items, the paper offers to give each day a prize to the child in attendance at one of the public schools who sends in the best bit of news reporting—it must concern an actual happening. The prize is a map globe, 37 inches circumference, mounted on an incline axis, and supported on

an oak stand, the height of stand and globe being 19 inches. To make it short, the globe is the best up-to-date thing of its kind on the market, and its finish is such that it would do credit to any library, reading room, parlor or studying room. If we mistake not, Mr. Thos. D. Horton, the clever, capable, silent gentleman, who so successfully manages the affairs of the New York and Richmond Gas Company, is in a way responsible for the instituting of this system of youthful news gathering; but, whether so or not, the column or so of it which appears every day, has done much to increase *The Globe's* circulation, and has stimulated the youngsters to the point where it is hardly safe for an adult to be seen coming out of any sort of a place other than a churchyard, or perhaps a church. The scheme, however, so far, has been succesful, several very newsy bits having been presented. To go back a trifle. Some time ago the North Shore of Staten Island was so poorly illuminated on public account that general dissatisfaction was expressed to the point where something had to be done. The authorities submitted a scheme for illumination to supplant the existing one, and the result was that in due time, when the contracts were awarded – despite the tantalum (well-named) tungsten, etc., craze—the New York and Richmond Gas Company was found to have received the lion's share of the awards. This brings us to the fact that the matter had received sufficient public mentioning to attract the attention of the embryo reporters, with the result that the prize for the "best bit of reporting" for the 3d inst. was awarded to Master Walter Wright, of Public School 20, whose message to *The Globe* was as follows: "The residents of the North Shore of Richmond Borough are highly delighted upon the installation by the city of the new system of street lighting. There is much speculation as to whether the new lights will prove satisfactory, but since their installation, which occurred last Friday night, they have lighted the streets materially. In addition to the electric lights this is a great advantage to the public and belated travellers. Heretofore the streets in the borough on many occasions have been in total darkness owing to the poor service of the electric light company. It is not definitely known whether the city is going to discontinue the use of electric lights by the end of the present year, but it is the impression of many that such will be the case."

Mr. Frederick Egner, in a recent communication to the Journal, notes that an interesting article, by Mr. E. Korting, General Director of the Imperial Continental Gas Association's plant, at Berlin, Germany, is backed up by another thesis on the like subject, by Dr. R. Geipert, of the same city. The matter has to do with "The Advantages, or Otherwise, of the 'Wet Process' in Coking Coal." Mr. K. remarks that a certain authority asserts that the "wet process" made the cost of the water gas produced thereby 60 per cent. greater than when such was manufactured in regular water gas sets. He then asserts, and clearly proves that, in an assumed yearly production of 141,256,000 cubic feet of water gas, if made in vertical retorts, and then mixed with coal gas, the saving will be $11,019.40, rather than if the coal gas and admixture of water gas were produced in separate apparatus. The authors appear to have taken into consideration all contingencies when making up their figures, and to have based them upon actual practice and thorough experience. Our readers, of course, understand that by the wet process nowadays is meant the method of coking gas coal in retorts, and during a portion of the time (generally in the last hour or two) to admit some steam to pass through the retort and coke, thus producing water gas; the "dry process," of course, being the old way of making coal gas, subsequently mixing the same with gas produced in water gas generators.

The authorities of Salem, Ore., have failed to be convinced of the good policy of taking over, for operation on municipal account, the plant of the Salem Gas Light Company. It is rather odd, to one at this distance, that the Salem people of the right sort do not get hold of that plant, rebuild it and run it in a modern way.

It is said that the bondholders' committee of the Detroit Gas and Coke Company has received a definite bid for the property, which is said to have been made by the Dawes-Geist syndicate.

The following excerpts from the circular notice recently mailed by Secretary J. Arnold Norcross show how the New Haven Gas Company proposes to issue its new debenture series in the sum of $1,000,000:

"Pursuant to authority heretofore given by the stockholders, and for paying the current indebtedness and meeting the Company's requirements in the near future, the Directors voted, on November 19, 1908, to issue, on October 1st, 1910, coupon debentures, Series D, to the amount of $1,000,000, convertible into stock on October 1st, 1925, or sooner, at the option of the Board of Directors.

"Stockholders of record at 5 P.M., November 19, 1908, are entitled to subscribe for the debentures to an amount equal to 33⅓ per cent. of the par value of their respective holdings; in other words, the holder of $300 of stock (par value) may subscribe for $100 of debentures.

"The debentures will be issued in amounts of $100, $500 and $1,000, with interest-bearing coupons at the rate of 5 per cent. per annum, payable semi-annually, on April 1 and October 1 in each year, and will contain the following clause: 'No right to subscribe to any future issue of stock, debentures or bonds shall accrue to the holder hereof, until the same shall have been converted into stock, pursuant to the terms and conditions under which this debenture is issued.'

"The ownership of rights attaching to 12 shares of stock will be necessary to entitle the holder to subscribe to one debenture of the par value of $100. Subscriptions under holdings of stocks that are not multiples of 20 may be adjusted by purchase of sale of rights. The Company will neither buy nor sell rights. The right to subscribe will expire at 3 P.M. on Tuesday, December 29, 1908, and all subscriptions and assignments of rights must be received at the office of the New Haven Trust Company, 40 Church street, New Haven, Conn., before that time. All rights to subscribe not utilized on or before the 29th day of December shall revert to the Company.

"Payment for the debentures subscribed for must be made to The New Haven Trust Company, of 25 per cent. on each of the following dates: Monday, February 1, 1909; Friday, October 1, 1909; Friday, April 1, 1910; Saturday, October 1, 1910. Interest on the payments at the rate of 5 per cent. per annum will be paid on October 1, 1909, April 1, 1910, and October 1, 1910, but no interest will be allowed on any advance payments."

"R. S. M.," writing from South Bend, Ind., under date of the 5th inst., says: "For over 2 months the gas tar pavement on Portage avenue and Leeper hill have stood the test. According to the City Engineer, Mr. Alonzo J. Hammond, the preparation has answered successfully to the tests; in fact, the pavement has more than withstood the trial in practice.

Mr. W. G. Reed, under date of the 1st inst., sends the following from the Denver *Republican*: "The successful experiments made by the Colorado and Southern Railroad with gas appliances in its shops, which will be fully demonstrated by Mr. F. W. Frueauff at the Chicago meeting of the National Commercial Gas Association, are of the utmost importance. I, as a mechanic in railroad coach repairing, etc., affirm that within 10 years the main fuel used in the repair shops of every railroad in the country will be gas."

Mr. W. H. Snow, Manager of the municipal gas and electric station operated by the municipality of Holyoke, Mass., reports that during the month of November the gas output equaled 16,699,546 cubic feet. The electric output amounted to 508,000 kilowatts for the like month. The quantities sent out on similar account, November, 1907, were 10,770,165 cubic feet, and 433,050 kilowatts, respectively.

The Williams-Luman Mining Company is installing on its huge mining properties at Shoshone, Wyo., a gas producer plant up to operating a set of boilers equal to the developing of 500-horse power.

Mr. A. C. Van Nest, of the home division of the Pintsch Compressing Company, is superintending the construction of the new Pintsch plant in the yards of the Maine Central Railroad, in Beaver, Me.

The property of the New Bern (N. C.) Lighting and Fuel Company was sold on November 23, 1908, by Geo. A. Nicoll, Receiver, to Samuel W. Smallwood for $40,000, and the sale has been confirmed by the Court. Mr. Smallwood, will conduct the business in his own name and not reorganize the Company

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PROPRIETORS.

THOS. J. CUNNINGHAM,
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MONDAY, DECEMBER 14, 1908.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 14.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated Gas Co.	$73,177,000	100	164½	165
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,500,000	100	130	160
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	102
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	100	101
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	86	91
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	148	150
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91⅝	92
Yonkers	299,650	509	130	—
Out-of Town Companies.				
Bay State	50,000,000	50	1⅞	2
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	63	66
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	89¾	89¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	—	—	74½	75
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	103	103½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis	10,000,000	100	—	100
Preferred	2,500,000	100	80	90
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,370,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	57	57¼
Preferred	25,000,000	100	89	89¼
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	100	100¼
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	92	—
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	620,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,485,000	1,000	96¼	—
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	102	—
Washington (D. C.) Gas Co.	2,600,000	20	337½	347½
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	230	—

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 9, 1908.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1909, to stockholders of record at the close of business, Dec. 31, 1908. Checks will be mailed.

1749-5 LEWIS LILLIE, Treasurer.

Position Wanted

As Superintendent or Manager of Gas or Electric Light Plant, or Both.

Graduate of Cornell University in mechanical and electrical engineering. Actively employed in combination company since 1903. References from leading engineers and managers and others familiar with my work and results. Open for employment after Jan. 1, 1909.

1749-tf Address, "A. B. C.," care this Journal.

Position Wanted.

Competent and reliable man of 10 years' experience desires position as superintendent or manager of gas company. Correspondence solicited.

Address, "SUPT.,"

1749-1 Care this Journal.

POSITION WANTED

By all-round gasfitter and complaint man, also meter repairer and prover, plain or prepayment. Best of references.

1749-1 Address, "W. J. F.," care this Journal.

Position Wanted

As Manager or Superintendent,

By competent gas man, 35 years of age, married, strictly sober, with operating experience both as manager and superintendent in actual charge of plants. A man who can show and give results; 17 years' experience; now acting as manager of coal gas plant in city of 15,000. Will have to give present people 60 days' notice. Address,

1737-eot-tf "RESULTS," care this Journal.

Position Wanted.

Have had 17 years' practical experience in charge of fitting, meter repair shop and all kinds of construction work of large company. Thoroughly understand house fitting and appliances. Am active and capable of devising and improving existing method of doing work and obtaining low costs.

Address, "SYSTEM,"

1748-2 Care this Journal.

WANTED, A BROADER OPPORTUNITY.

I am a heavy stockholder and manager, with excellent record, of one of the best, 675-consumer water gas plants in the Middle-West. Also, recently designed complete plant and supervised construction of works in city of 8,000, which is acknowledged by all, including one of the best gas engineers in the United States, as best plant of its class in this section. I enjoy the complete confidence of my associates, and have entire business and technical management of my company. Am married; am 30 years old, and began at the bottom. I want an interest and management of company in a city of 20,000 to 40,000, where results are desired and appreciated.

1748-4 Address, "ENGINEER," care this Journal.

WANTED,

A Position as Superintendent or Manager.

Five years' experience in constructing gas and electric properties. Three years' experience as superintendent of manufacture and distribution of gas. Prefer superintendent or manager of a gas property sending out 500,000 cubic feet per day or more. Can refer to present employers, and am open for employment after Jan. 1, 1909, or earlier if required. Address, "B—X.,"

1748-3 Care this Journal.

Situation Wanted.

Energetic young man wants situation as manager of gas company. At present in charge of plant sending out 18,000,000. Practical experience in all branches of the manufacture and distribution of coal, oil and water gas, good office manager and a hustler for new business. First-class references.

1748-2 Address, "COMPETENT," care this Journal.

WANTED,

Gas Meter Repairers.

Must be experienced.

1749-2 Address, - "BOX 100," care this Journal.

WANTED,

Young Man as Traveling Auditor,

Who has had experience in gas and electric business. Headquarters, Boston, Mass. Give full particulars; state age and salary required.

1749-1 Address, "R. H. G.," care this Journal.

WANTED,

GASFITTERS,

For inside piping and stove runs. Apply,

MAQUOKETA LIGHT AND HEAT CO.,

1749-1 MAQUOKETA, IA.

FOR SALE,

One Pair 8 x 10 x 5 Dry Lute Purifying Boxes.

Steel, with center seals and connections and duplex hoist. CALUMET GAS CO.,

1741-tf LAURIUM, MICH.

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DOES IT
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A PERFECT OIL
SPRAY AT LAST.

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ALSO THE SCHREIBER
SPRAY FOR AMMONIA POWER SCRUBBERS.

1749-4

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NO EXTRA LABOR OR OPERATING EXPENSES.

IMPROVED AMMONIA CONCENTRATOR.

About 100 in use. Write to

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MICHIGAN AMMONIA WORKS, - Detroit, Mich.

Of all the gas exhibits to be made in Chicago this December none will be more impressive and inspiring than the

70,000 HUMPHREY GAS ARC LAMPS

in regular commercial use. Good gas, good lamps, good service, will always win. :: :: :: :: :: ::

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Kalamazoo. **New York.** **San Francisco.**

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ROCHESTER, N. Y.

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We Manufacture Electrical Thermometric Instruments for all departments of Gas Making.

Fery Pyrometers.

Rare Metal Thermo-Couples.

Base Metal Thermo-Couples.

Resistance Thermometers.

THE FERY RADIATION PYROMETER IN USE.

Described in Booklet A-4001, Sent on Request.

View of Rotary Meter House, Croydon (England) Gas Works.

The Croydon Company first installed (1903) a small Rotary to measure air to purifiers. In 1904 a Rotary of 80,000 cubic feet per hour was set to measure water gas make. This latter machine has been in continuous service since it was installed.

In 1906 Mr. J. W. Helps, Engineer and General Manager of the Croydon Company, in view of the satisfactory service given by the above machines, determined to install two additional Rotaries—one of 180,000 cubic feet per hour and another of 25,000 cubic feet per hour. The above illustrations show the exterior of the house erected to accommodate these meters and the interior of the same. The smaller one takes care of the make when the send-out falls below the minimum of the larger machine.

ROTARY METER COMPANY

One-half the cost—One-tenth the space of old style wet meters.

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ROTARY METER COMPANY,

280 Broadway,

NEW YORK.

Send for Catalog.

P. PLANTINGA, President. W. E. STEINWEDELL, Secretary.

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Main Office and Shops

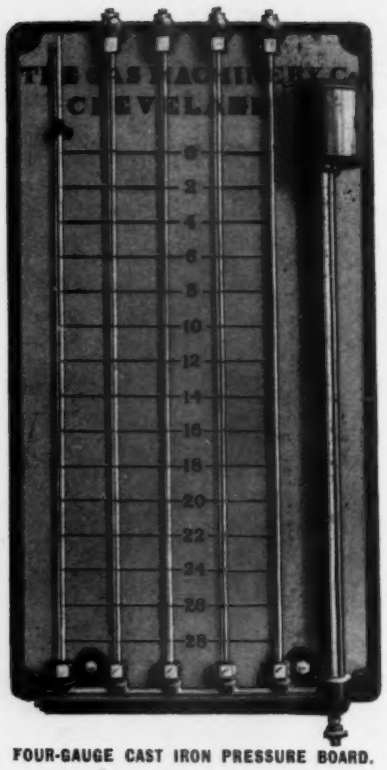
CLEVELAND, OHIO.

NEW YORK OFFICE, - - 56 PINE STREET.

COAL AND WATER GAS APPARATUS.

EXHAUSTERS, CONDENSERS, SCRUBBERS,
TAR EXTRACTORS, WASHERS, PURIFIERS,
VALVES, CONNECTIONS,

BY PRODUCT MACHINERY,
COMPLETE GAS PLANTS.



FOUR-GAUGE CAST IRON PRESSURE BOARD.

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CLEVELAND, OHIO.

DIDIER-MARCH COMPANY,

Hudson Terminal Building,

WORKS:
Keasbey, Perth Amboy, N. J.

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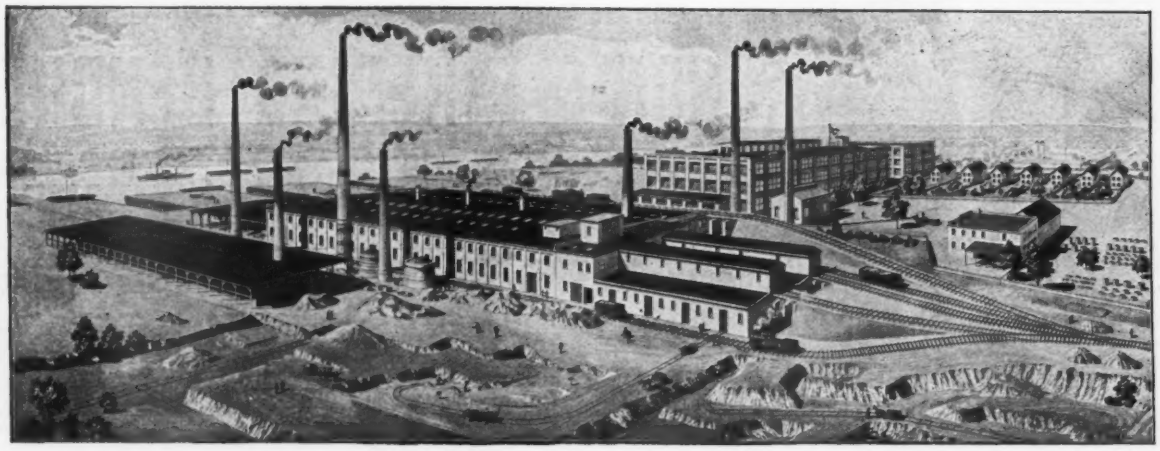

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DESSAU SYSTEM OF VERTICAL RETORTS, HORIZONTAL AND INCLINED BENCHES,

Acid-Proof Stoneware of Every Description, from Single Pieces to Entire Plants. :: ::

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Benches.—We erect GAS RETORT BENCHES with Horizontal retorts having closed ends, or Through retorts up to 20 feet in length.

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Stoking Machinery.—Sole Agents for U. S. and Canada for the Fiddes-Aldridge Simultaneous Discharging Charger. The "F.A.," or "One-Stroke" Machine. Cost of Carbonizing reduced to minimum. No Dust. Silent. No Waste of Coal. No Injury to Retorts.

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Retort Houses and Conveying Machinery.—We also build Retort Houses, Coal and Coke Conveying Machinery. Plans, specifications and estimates cheerfully furnished.

CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE AS OF ST. LOUIS.

NON-CLINKERING BENCHES

EQUIPPED WITH

"THE MOUTHPIECE THAT DON'T COME OFF."

PROPOSALS FURNISHED ON EVERY TYPE OF INSTALLATION.

TRY OUR LITTLE "3-HOUR SCURFER."

Write for our Bulletin No. 2.

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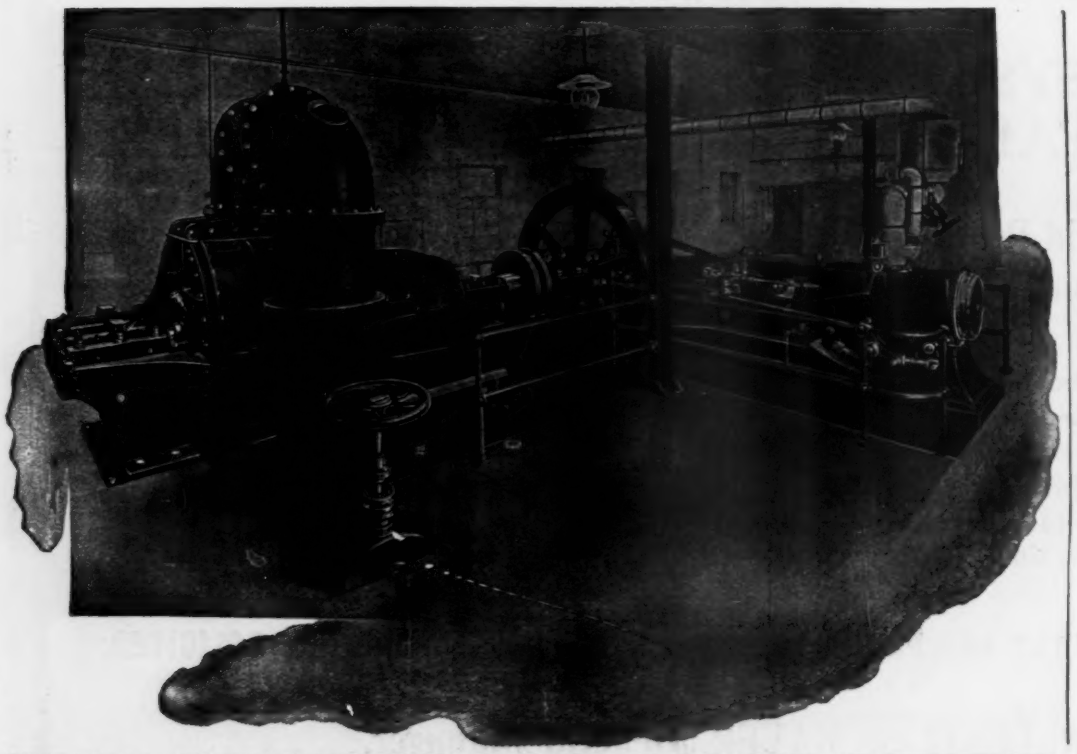
CONNERSVILLE GAS EXHAUSTERS

AND HIGH PRESSURE GAS PUMPS.



THIS cut shows one of our High Pressure machines and a 4-valve engine connected by one of our leather link flexible couplings. Two of these units were installed for the Peoples Gas Light and Coke Co., Chicago, at their 73d St. Station. Each machine has a capacity of 14,000,000 cubic feet per day.

We also manufacture

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BY-PASS VALVES,
PRESSURE REGULATORS,
ETC., ETC.

Correspondence Solicited.

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Connersville, Indiana, U. S. A.

NEW YORK OFFICE, 50 Church Street. - - HORACE G. COOKE, Selling Agent.

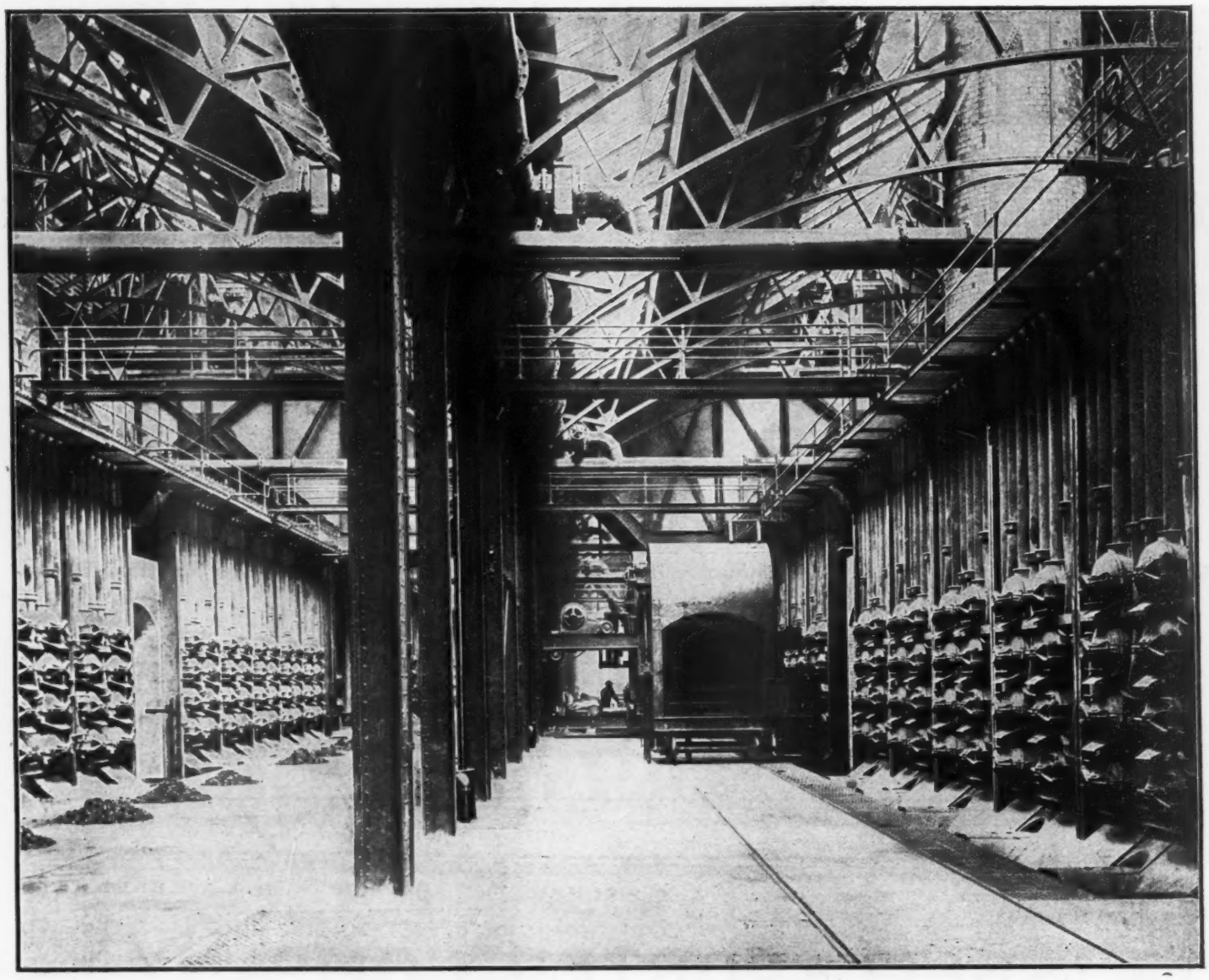

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PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

COMPLETE COAL GAS PLANTS.

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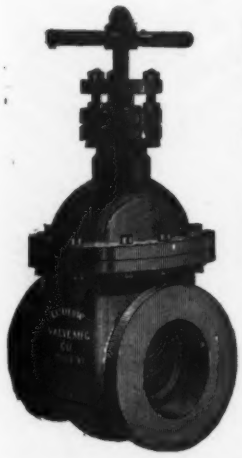

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Double and Single Gate Valves, ¼" to 72",

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Gas, Water, Steam, Oil, Ammonia, Etc.

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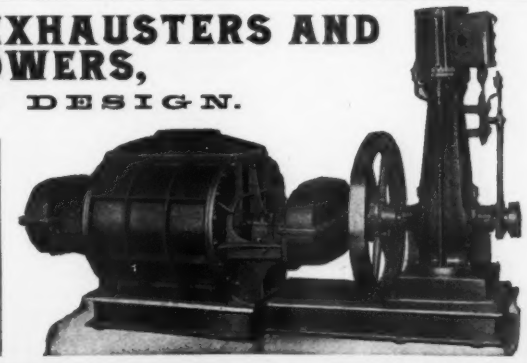

Practical Handbook on

GAS ENGINES,

With Instructions for Care and Working of the Same,

By G. LIECKFELD, C.E.

Translated with Permission of the Author

By GEO. M. RICHMOND, M.E.

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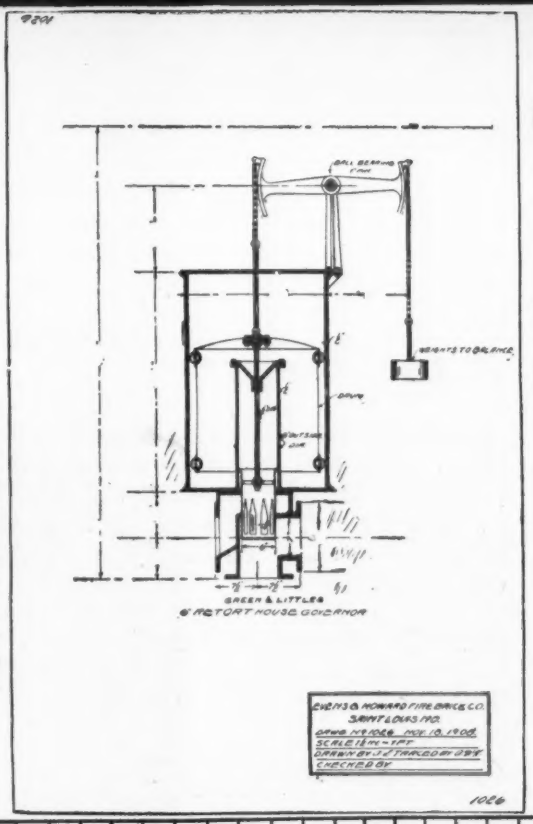
REGULAR Illuminating Quality.

Even with unskilled or green men in the retort house one regular quality of gas is made. There is no risk of pulling in air or forcing gas back through the retort into the settings. Seal on dip pipe can be reduced to $\frac{1}{8}$ of an inch.



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DETAILS AND PRICES ON APPLICATION.

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Type "A" Dry Gas Meters

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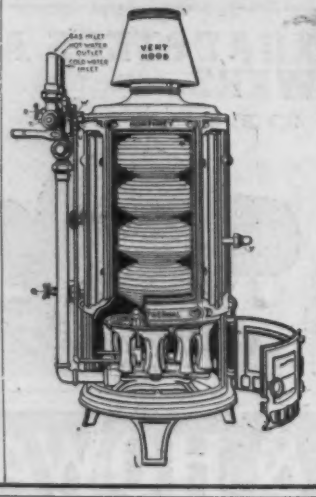

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Have every known desirable feature helping to efficiency, economy, durability and absolute safety.

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Gas Service Cocks.

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An invalid oftentimes is the picture of health, and likewise poor gas cocks often give outward promise of quality and service.

It takes investigation to determine the true condition.

Mueller Gas Cocks incite investigation. Back of a good outward appearance will be found a solid body of red brass, walls of a uniform thickness and carefully matched openings.

Made in all patterns and all styles of pipe connection and UNCONDITIONALLY GUARANTEED.

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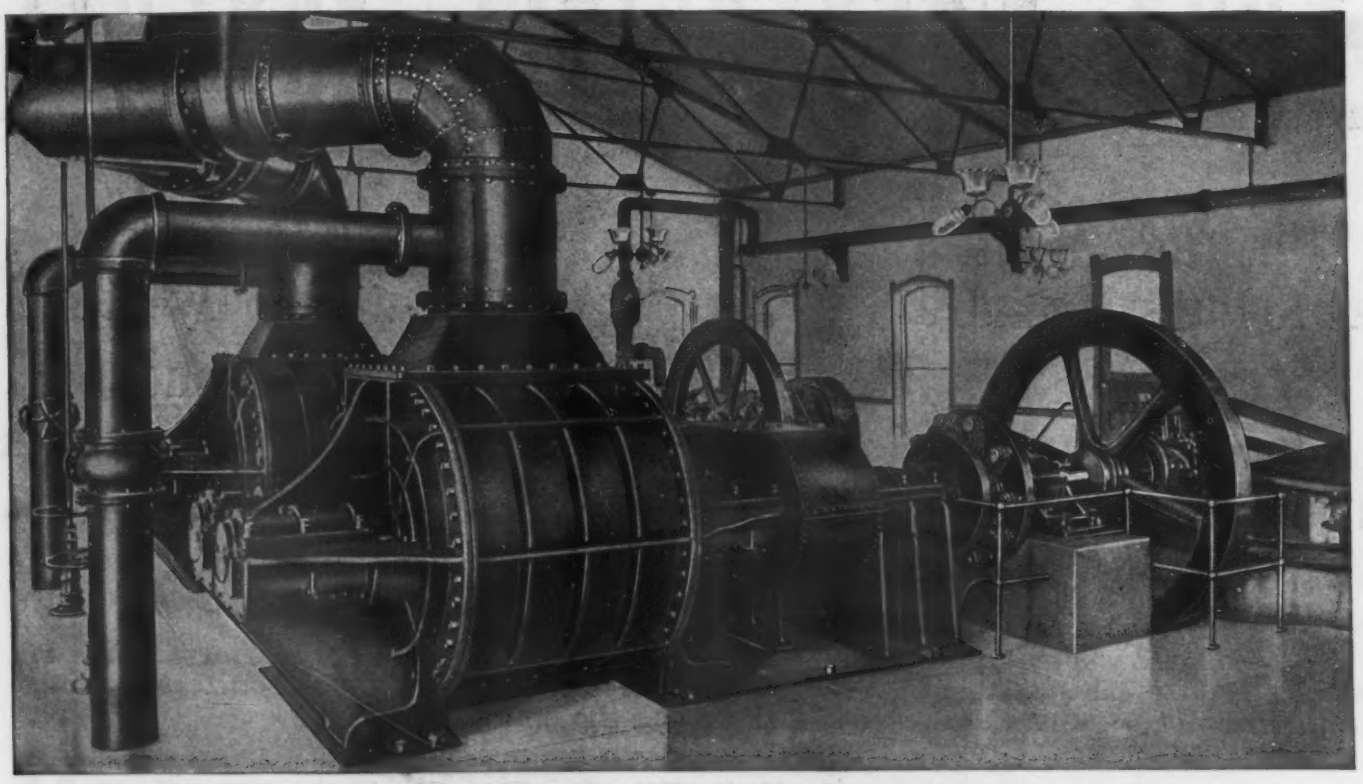
An installation of two units, each handling 800,000 cubic feet per hour, under 5 pounds per square inch, installed for the Peoples Gas Light and Coke Company, Chicago, Ills.



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It won't Flood the Mantle at 40-10ths Pressure.

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Will not Blacken the Mantle when Turned Low.

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Let us suppose you adjust the Bray with your pressure at 20-10ths. If, for any reason, the pressure should go down to 10-10ths, this burner will not flash back or carbonize; or, should the pressure raise to 30-10ths, the Bray will not blacken the mantle.

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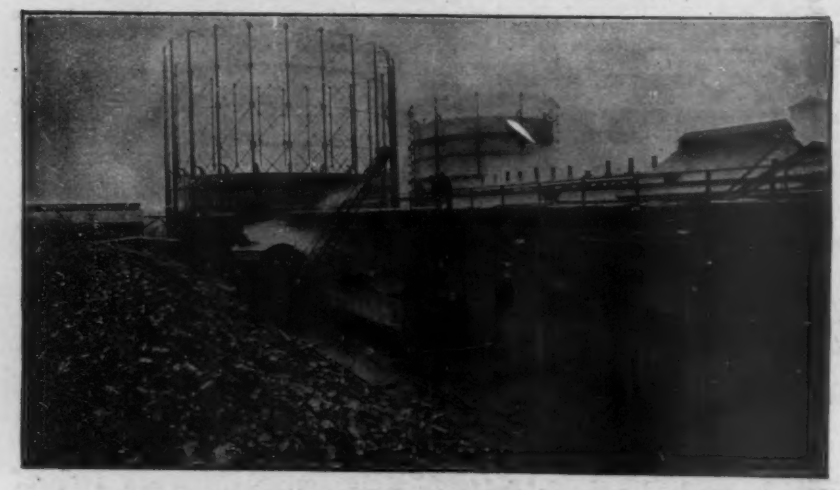

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By G. LIECKFELD, C.E. Translated with Permission of the Author, by GEORGE M. RICHMOND, M.E. Price, $1.

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

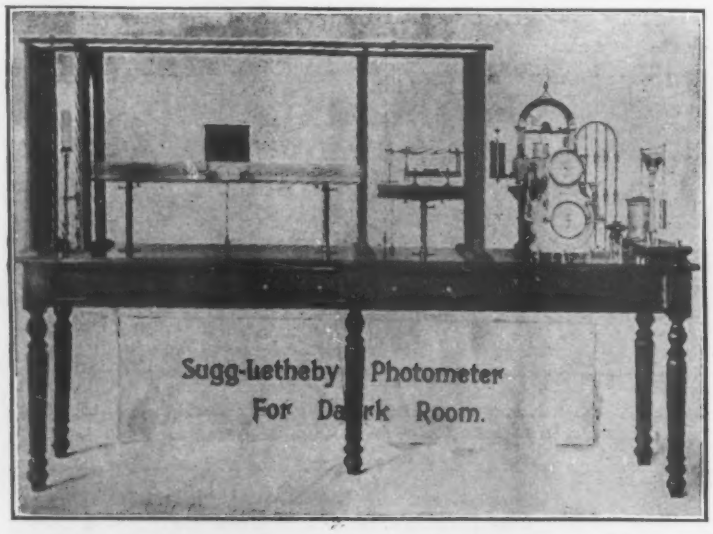
DECEMBER, 1908.

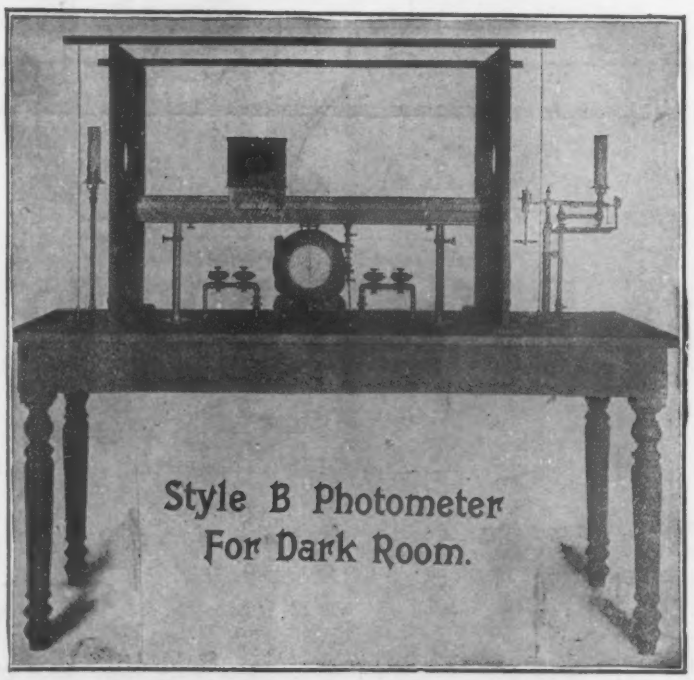
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	12.00 PM	6.00 AM
Wed.	2	1.10 AM	6.00
Thu.	3	2.20	6.00
Fri.	4	3.30	6.00
Sat.	5	4.40	6.00
Sun.	6	No L.	No L.
Mon.	7	No L. FM	No L.
Tue.	8	No L.	No L.
Wed.	9	5.00PM	7.10 PM
Thu.	10	5.00	8.00
Fri.	11	5.00	9.00
Sat.	12	5.00	10.00
Sun.	13	5.10	11.00
Mon.	14	5.10	12.00
Tue.	15	5.10 LQ	1.00 AM
Wed.	16	5.10	2.00
Thu.	17	5.10	3.00
Fri.	18	5.10	4.00
Sat.	19	5.10	5.00
Sun.	20	5.10	6.20
Mon.	21	5.10	6.20
Tue.	22	5.10	6.20
Wed.	23	5.10 NM	6.20
Thu.	24	5.10	6.20
Fri.	25	5.10	6.20
Sat.	26	5.10	6.20
Sun.	27	5.10	6.20
Mon.	28	9.50	6.20
Tue.	29	11.00 FQ	6.20
Wed.	30	12.10AM	6.20
Thu.	31	1.20	6.20

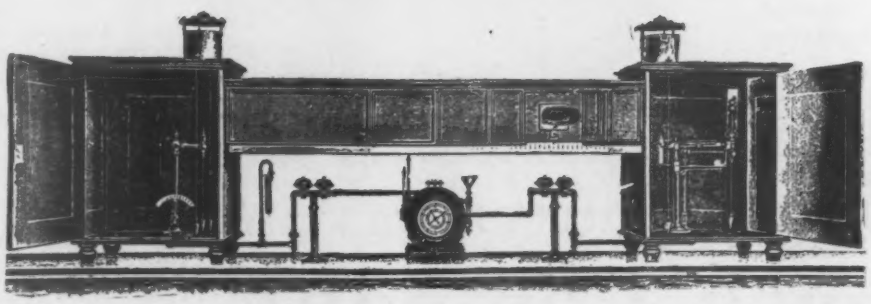
TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs.Min.
January....	228.30
February...	187.30
March.....	192.00
April.....	160.10
May.....	155.10
June.....	138.00
July.....	155.50
August....	173.40
September..	185.20
October....	214.00
November..	218.10
December..	226.40
Total, yr..	2235.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

DECEMBER, 1908.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Complete Lighting in One Hour From Time Given P. M.	Complete Extinguishing in 50 Minutes From Time Given A.M.
Tue.	1	4.07	5.52
Wed.	2	4.07	5.52
Thu.	3	4.02	5.57
Fri.	4	4.02	5.57
Sat.	5	4.02	5.57
Sun.	6	4.02	5.57
Mon.	7	4.02	5.57
Tue.	8	4.02	5.57
Wed.	9	4.02	5.57
Thu.	10	3.57	6.07
Fri.	11	3.57	6.07
Sat.	12	3.57	6.07
Sun.	13	3.57	6.07
Mon.	14	3.57	6.07
Tue.	15	3.57	6.07
Wed.	16	3.57	6.07
Thu.	17	3.57	6.17
Fri.	18	3.57	6.17
Sat.	19	3.57	6.17
Sun.	20	3.57	6.17
Mon.	21	3.57	6.17
Tue.	22	3.57	6.17
Wed.	23	3.57	6.17
Thu.	24	4.02	6.22
Fri.	25	4.02	6.22
Sat.	26	4.07	6.22
Sun.	27	4.07	6.22
Mon.	28	4.07	6.22
Tue.	29	4.07	6.22
Wed.	30	4.07	6.22
Thu.	31	4.12	6.27

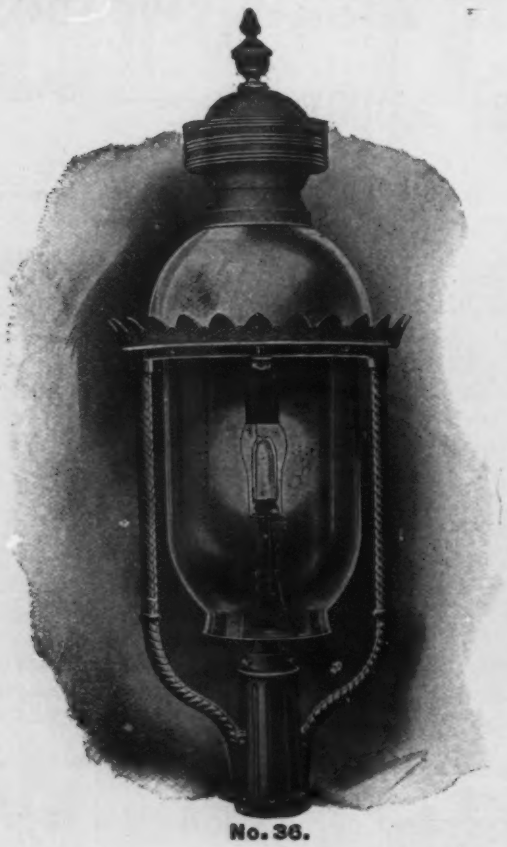
TOTAL HOURS DURING 1908.

	Hrs.Min.
January....	481.50
February...	329.15
March.....	351.50
April.....	341.50
May.....	233.05
June.....	218.10
July.....	282.55
August....	254.55
September..	292.25
October....	420.45
November..	374.30
December..	411.05
	3992.35
Deduct on account of 50 min. extinguishing time.....	30.30
Total, yr..	3962.05

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
CHICAGO, 218 La Salle Street.
SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY

....OF AMERICA....



No. 36.

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

Welsbach Junior

THE BIGGEST LITTLE LIGHT IN THE WORLD.

The Welsbach Junior Light is 5 inches high--consists of burner, mantle and chimney--and is attractively boxed in a pasteboard carton.

As its effectiveness and economy become better known the Welsbach Junior will supersede, for universal use in the home, the old-style open flame gas burners.

Showing Welsbach Junior Light used in connection with ordinary glass globe.

Gives 50-Candle Power.

Uses Two Feet of Gas per Hour.

Attaches to Any Gas Fixture.

Completely Hidden from View.

Use your own globe--either gas or electric.

SMALL—EFFICIENT—ECONOMICAL.

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FACTORIES:
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Columbus, O.

Salesrooms in all Leading Cities of the United States.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

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Largest Builders of CARBURETTED WATER GAS PLANT IN AMERICA.

SOLE AMERICAN BUILDERS

OF THE

Standard Double-Superheater Lowe Water Gas Apparatus.

1907 CONTRACTS.

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Helena, Mont.
Bridgeport, Conn. (3d contract).
Suffolk, Va.
Winsted, Conn. (2d contract).
Nashua, N. H.
Augusta, Me. (2d contract).
Everett, Mass.
Jenkintown, Pa. (2d contract).
Coney Island, N. Y.
Mexico, Mo.
Jacksonville, Fla.
Syracuse, N. Y. (2d contract).
Atlanta, Ga. (2d contract).
Holyoke, Mass.
Peoria, Ills.
Schenectady, N. Y. (2d contract).
Danbury, Conn.
Galveston, Tex. (2d contract).
Quebec, Canada.
Indianapolis, Ind. (2d contract).
Bessemer, Ala.
Waterbury, Conn. (5th contract).
Sioux Falls, S. D. (3d contract).
Philadelphia, Pa.
New Hartford, Conn.
Poughkeepsie, N.Y. (2d contract).
Nashville, Tenn.
Salisbury, Md.
Norfolk, Va. (4th contract).
Wallingford, Conn.
Richmond, Va. (2d contract).
Oak Bluffs, Mass.
Arlington, Mass.

TOTAL SETS INSTALLED DURING YEAR, ... 43
TOTAL SETS INSTALLED TO DECEMBER 31, 1907, ... 677
TOTAL DAILY CAPACITY, TO DECEMBER 31, 1907, ... 545,865,000 cu. ft.

Tar Extractors for Carburetted Water Gas.
Photometrical Apparatus.
Gas Analysis Apparatus.
Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.
Waste Heat Boiler.
Hygrometer.
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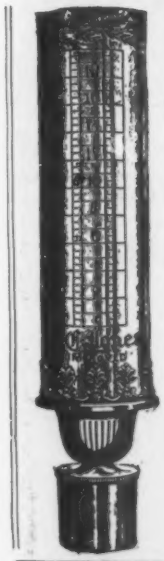

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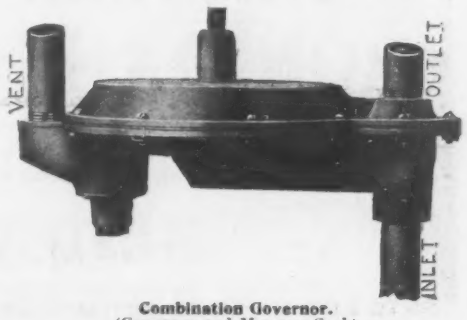

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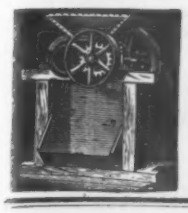

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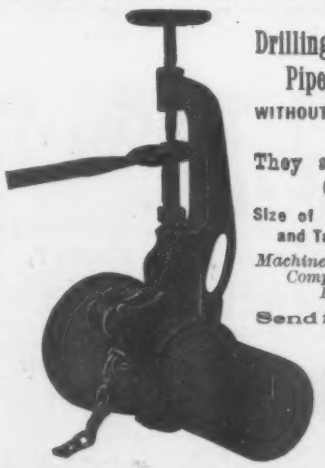

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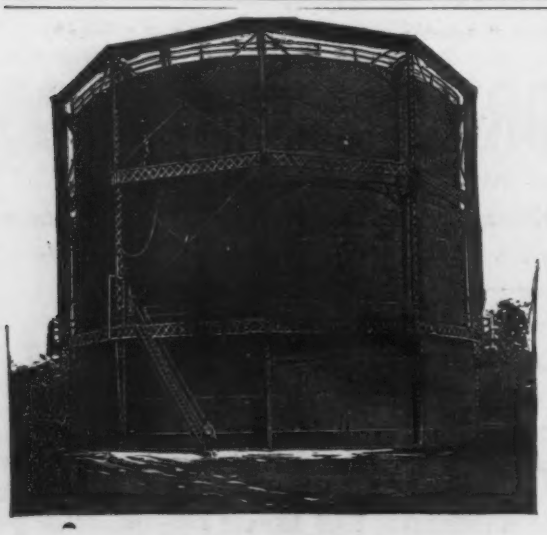

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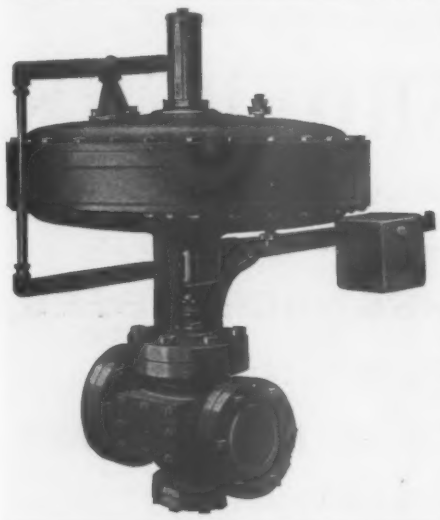

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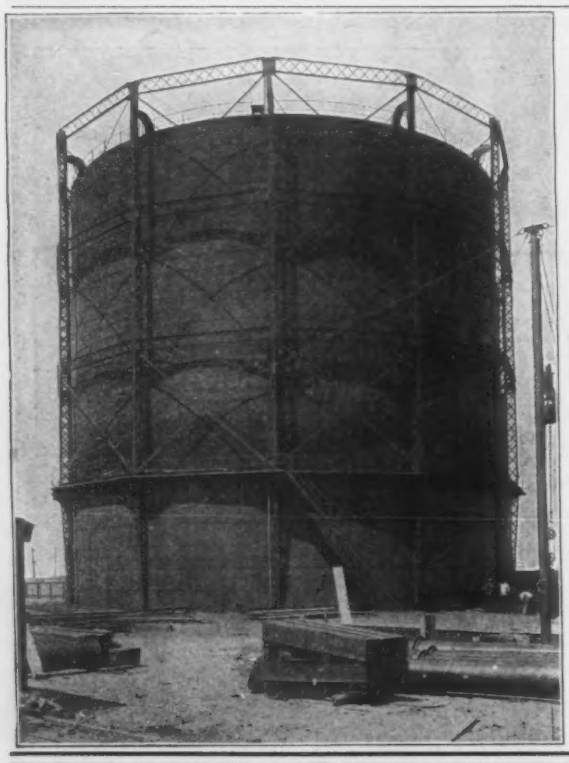

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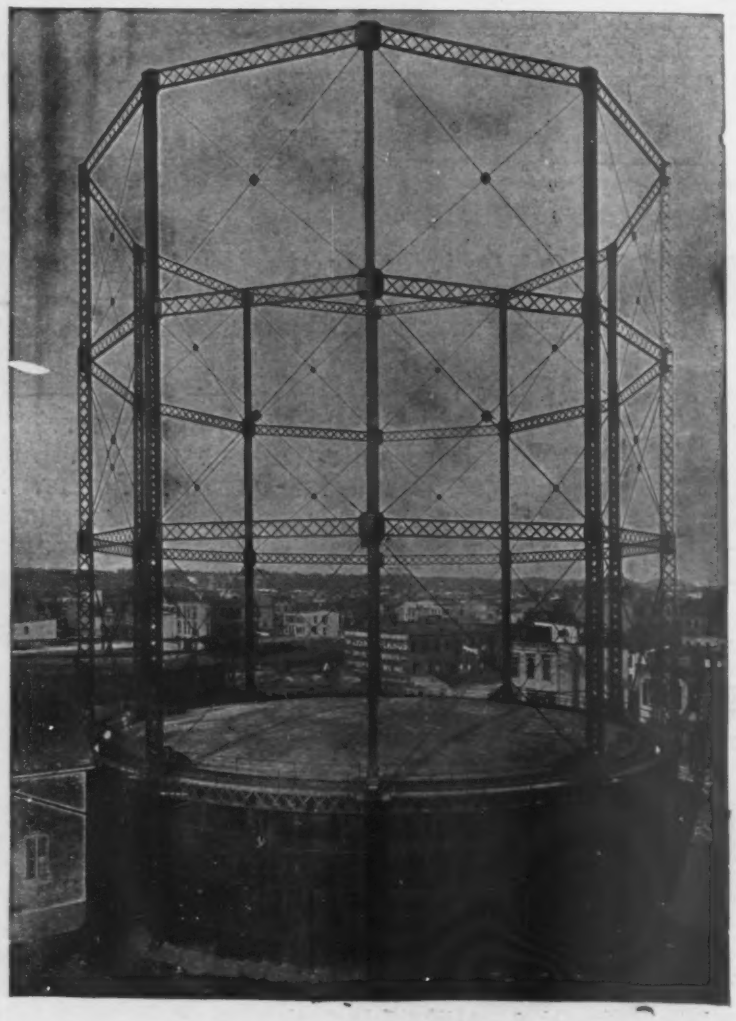

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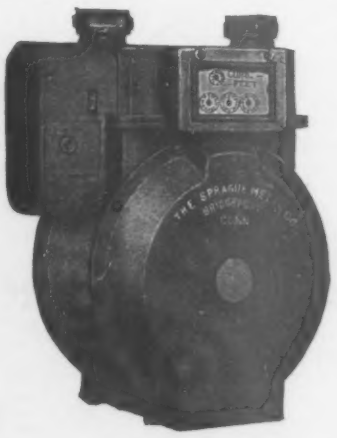

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